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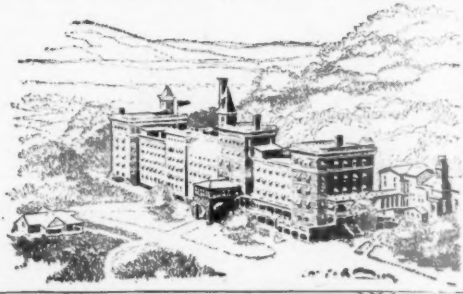

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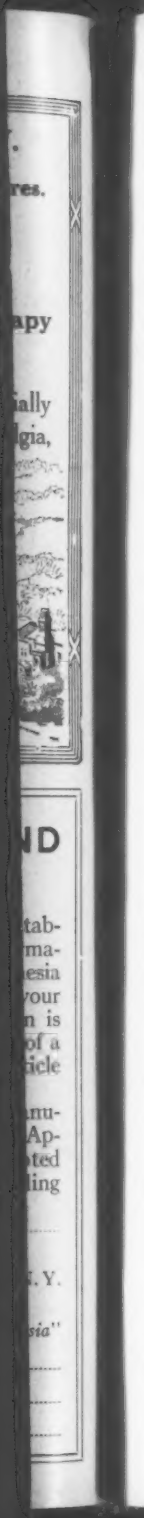

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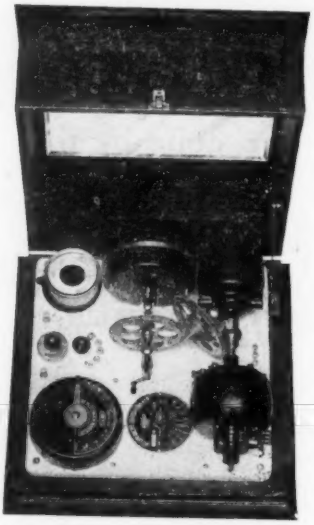

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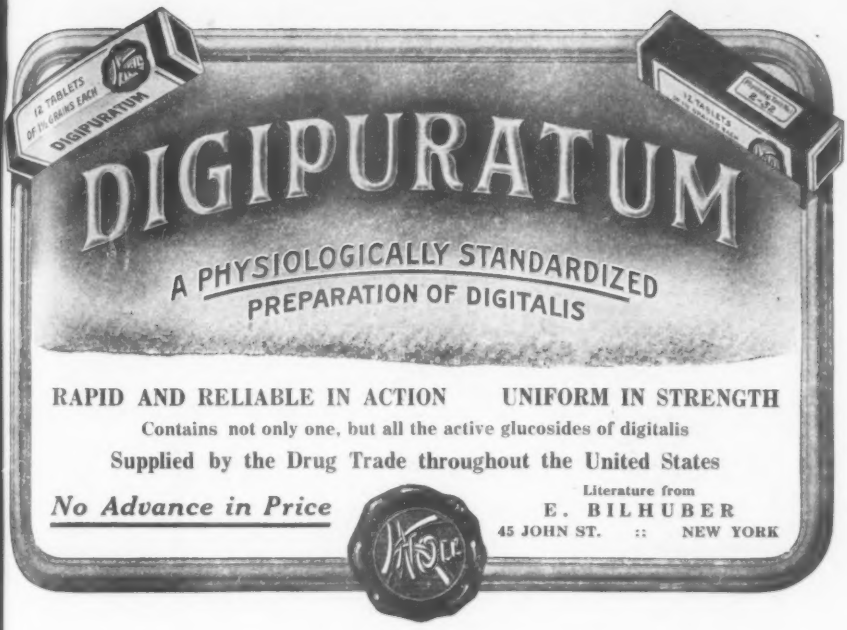
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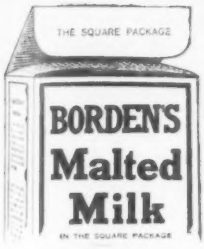

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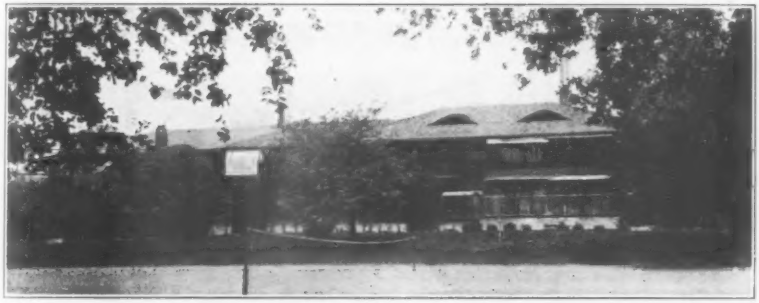

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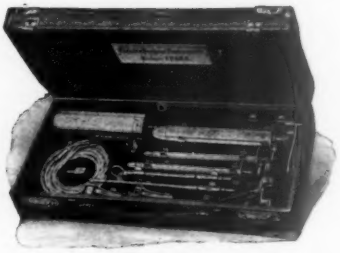

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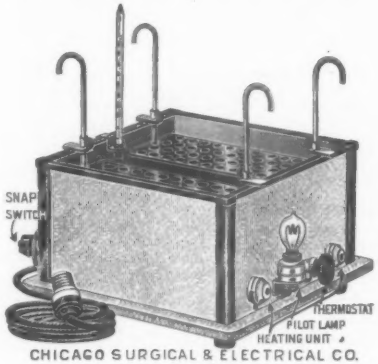

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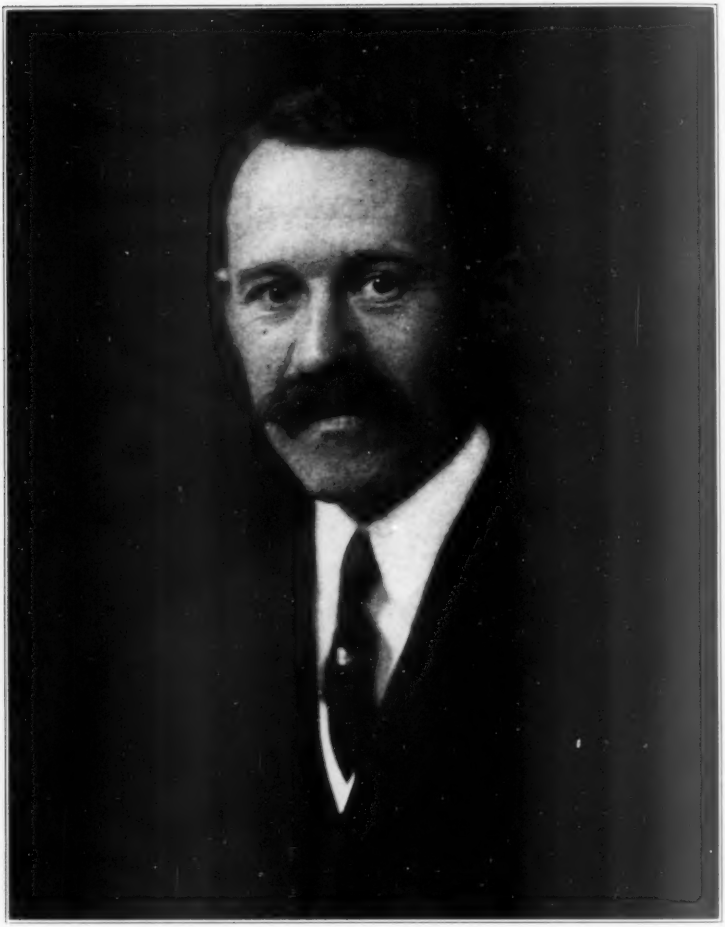

THEODORE CALDWELL JANEWAY, A.M., M.D.

THEODORE CALDWELL JANEWAY, A.M., M.D.

THEODORE CALDWELL JANEWAY was born in New York City on November 2, 1872, and died in Baltimore on December 27, 1917, in the forty-sixth year of his age. He was the son of Edward Gamaliel Janeway, the celebrated physician. These men served two succeeding generations with surpassing fidelity. The elder Janeway was a silent, studious, keenly observant man, with a heart full of the kindliest spirit. He was one of the physicians of the old-fashioned school to whom the sense of having been of service to a family in trouble was of far greater significance than any other reward. At a dinner given to Theodore Janeway by his friends in New York just before his removal to Baltimore, he spoke beautifully of his father's influence upon him, of the injunction repeated from his childhood, "You are to be a physician," and of his deep-seated sense of obligation that since he was the son of such a father he must be a good physician.

Theodore Janeway was graduated from the Sheffield Scientific School in 1892. He had there come under the influence of Chittenden. He graduated from the College of Physicians and Surgeons, Columbia University, in 1895, and later served as intern at St. Luke's Hospital. At the time of the reorganization of the New York University and Bellevue Hospital Medical College, in 1898, of which institution his father was Dean, he became instructor and then lecturer on medical diagnosis, which position he filled until 1905. He also worked in his father's office and had the opportunity of seeing the rare and puzzling diseases which passed through his father's hands. He was the first instructor in medicine in New York City to attempt to teach the subject from the stand-point of disease being a deviation from the physiological normal; he wrote a book on the subject of blood-pressure, and designed the first satisfactory apparatus for the clinical determi-

nation of the blood-pressure at the bedside. His reports to the faculty concerning the reorganization of the dispensary, of which he had charge, were models of their kind. The discouragements encountered at this time can scarcely be appreciated by the medical student of the present day. He knew how his father had fought for better hospital conditions and had failed to effect any betterment. It is, perhaps, not yet time to write of the difficulties of his life at this period, or of the failure of some of the older men of the college with which he was associated to correctly read the future trend of medicine in this country or to appreciate the ability of this brilliantly endowed young man. The conditions were such as to cause him to resign from the college.

Continuing in his father's office, he also became visiting physician to the City Hospital, of which at that time his friend Dr. Horst Oertel was pathologist. Here he gave optional clinics to the students of the College of Physicians and Surgeons, illustrating them with the demonstration of pathological material, after the manner of the great teaching clinics of the Old World. His success was marked, in 1907, by the endowment of the pathological work by Mrs. Russell Sage in her creation of the Russell Sage Institute of Pathology and by his appointment as associate professor of medicine at Columbia. This appointment was quickly followed by his elevation to the Bard Professorship of Medicine in 1909. This was frankly because he, at the age of thirty-seven, had no equal in this country. He worked at this time without sparing himself. Laboratory, teaching, the reorganization of the great Presbyterian Hospital along modern lines, as well as a private practice, made the burden so great that his health broke down in 1914 and he was obliged to pause and rest.

In 1914 another great decision presented itself. He was asked to become a "full-time" professor of medicine at the Johns Hopkins Medical School, to take the chair previously held by Osler, but under new conditions. These were that all fees derived from private practice were to be turned over to the hospital and that an academic salary was to be the only recompense. In discussing the matter with the writer previous to his decision, he said he was sure his father would have told him to take the position. Here it required a leader of men to fill the place, but it required above all a conscientious fealty to what is best in life to make the

decision. He moved to Baltimore and remained there until his untimely death from pneumonia on December 27, 1917. During recent months he had been serving under General Gorgas as major in the United States Army. He was director of research on the subject of heart disease among the soldiers, his own extensive researches into such conditions making him the natural leader in these efforts. He was as much a sacrifice to his country as though he had perished on the battlefield. As he had done when a younger man, he would work until tired out and then work three hours longer. He burned himself out in devotion to duty, and, by the dedication of his life to the altruistic service of mankind, accomplished in the short span of forty-five years a marvelous amount of good work. He overcame the powerful opposition to proper hospital reorganization in New York and gave to students the stimulating incentive only to be conferred by a real master of medicine. His own opinions of hospital reorganization he thus expressed in 1912:

"A medical clinic such as has been outlined could undertake the whole instruction in medicine of from 100 to 120 students. An analysis of its organization shows at once that it is the British or Scottish teaching hospital surmounted by a German university clinic. Our American hospitals were the direct outgrowth of their British predecessors, but they had to be cramped and modified to meet conditions originally provincial; now, in our large cosmopolitan cities, they are rapidly returning to their original lines. It does no violence to tradition therefore to integrate them into a great university medical school and to add to them that coördinating activity of a clinical master which shall develop their latent possibilities of larger educational usefulness and permeate them with that atmosphere of tireless scientific investigation which Americans seek in Germany today. Is it too much to hope that, with American energy and open-handed American generosity at our disposal, the talent for organization—which has been so marked a feature of our contemporary industrial life—may in the next generation make of our American medical clinics institutions for the treatment of the sick, sought alike by poor and rich, and centers of instruction for the world?"

Shortly after this was written came the happy days spent in London, in 1913, at the last International Medical Congress, at

which both he and Friedrich von Müller, of Munich, were among the guests of Osler at Brown's Hotel, days which had little warning that the Spirit of Evil would obtain dominion over the minds of those who caused the war.

Many competent to judge agree that the loss of Janeway is the greatest that medicine in this country could have suffered.

Slight in frame, nervous in temperament, but never irritable, speaking quickly and easily, fond of wit and merriment, interested in all forms of charity and public benefit, devoted and generous to his friends, charitable to those whose actions clashed with his ideals, he fought a good fight and lived to see the triumph of his principles.

In 1898 he married Eleaner Alderson, who steadfastly upheld him in the struggles that beset his life. He also is survived by his mother, Mrs. E. G. Janeway, and five children, Eleaner A., Edward G., Agnes, Charles A., and Francesca.

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ORIGINAL ARTICLES

A SOCIOLOGIC AND MEDICAL STUDY OF FOUR HUNDRED CIGAR WORKERS IN PHILADELPHIA.*

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(From the Clinic for Diseases of Occupation of the Hospital of the University of Pennsylvania in coöperation with the Pennsylvania State Department of Labor and Industry.)

Introduction. About one year ago the Industrial Board of the Pennsylvania State Department of Labor and Industry asked the clinic for diseases of occupation of the University Hospital for some information which might help its members to decide whether or not children under sixteen years of age should be allowed to work in banding and packing rooms of cigar factories. A review of the literature upon the effects of tobacco work was unsatisfactory, and an investigation of the cigar industry in Philadelphia was therefore planned, including a survey of the hygienic conditions of some of the factories and an intensive study of a limited number of employees. The former study appears in a separate communication,† while this one presents a review of the literature and a study of the social and medical histories and the physical examinations of 400 workers in that industry.

Literature. In the first treatise upon the diseases of tradesmen, written by Ramazzini[1] in the latter part of the seventeenth

*Read before the Philadelphia County Medical Society.

† Smyth and Miller: A Hygienic Survey of Cigar Manufacturing in Philadelphia, Med. and Surg., September, 1917.

century, a chapter was devoted to tobacconists or those who made snuff. The author recognized among them nervous, gastro-intestinal, and respiratory disturbances, and since his time the genital and circulatory systems have been included among those described as being affected injuriously by tobacco work. The extent of the injury done by tobacco has, however, been a disputed problem since Ramazzini's time, and the controversy has called forth numerous publications, particularly in the last half-century. Some of the writers, including Duchatalet,[2] Thackrah,[3] and Arlidge,[4] denied any injurious influences, while Schwabe[5] and Piasecki[6] even ventured to say that working in tobacco was healthful. Rochs[7] believed that the work in sufficiently ventilated rooms was harmless, while Oliver[8] found nothing in the French, Spanish, or British factories to lead him to regard it as an occupation dangerous to health, and Rambousek[9] stated as late as 1913 that the industrial poisoning from tobacco was not proved. On the other hand, Merat[10] believed that tobacco factories were incubators for serious disease conditions, and Rosenfeld,[11] who made a careful study in 1889 of the Austrian statistics, including 35,164 workers from twenty-eight factories, found high morbidity and mortality rates. Kober[12] stated that a lowering of general resistance resulted from this work.

The respiratory system seems to have attracted most attention. Ramazzini[1] spoke of the workers sneezing, and of the horses, which were used to grind the tobacco into dust, coughing and blowing their nostrils. Melier,[13] in 1844, spoke of a transitory bronchitis among tobacco workers, but claimed that the work arrested tuberculous disease, as did also Reuf.[14] Hirt[15] described an irritation of the bronchial, nasal, and conjunctival mucous membranes in beginners at this work, but found no tendency to chronic catarrh, chronic pneumonia, emphysema, or tuberculosis. He exposed rabbits and dogs to tobacco dust for several months, but was never able to provoke any signs of catarrh or a loss of appetite, although at autopsy some brownish spots and some atrophic areas were found in their lungs. Merkel,[16] in 1882, found fine brown spots in the lungs of tobacco workers, and after this there were many reports of lung diseases, particularly tuberculosis. Rosenfeld[11] stated that tuberculosis was the disease of the tobacco worker, finding 1.73 per cent. of the Austrian workers to be tuberculous, whereas the percentage among factory workers in general was only 1.25, and Schellenberg[17] found that the tuberculosis death-rate of cigar workers in one town of Baden between 1887 and 1893 ranged between 1.77 and 2.7 per cent., whereas for the total population during the same period it was 0.27 to 0.29. Stephani[18] found a high tuberculosis morbidity rate as well, and Abelsdorf[19] declared that women were affected more frequently than men.

Hoffman[20] showed that the United States statistics for 1909 gave cigar makers and tobacco workers a higher death-rate from all

causes in each age group than they did the manufacturing and mechanical class or the mercantile and trading class. He presented tables for comparisons, by age groups, of the total and the tuberculosis mortality of tobacco workers with that of all occupied workers in England and Wales (1900 to 1902), which, on the whole, gave the tobacco workers a higher percentage. In some age groups, however, the reverse was true, and in Switzerland (1871 to 1890), according to statistics which he also presented, the tuberculosis mortality for tobacco workers under forty years was less than for all occupied males. He was able to show finally that the proportionate mortality from consumption among 141 tobacco workers (1897 to 1906), as indicated by the figures of an industrial insurance company, was 38.8 per cent. against 14.8 per cent. for all males in the registration area of the United States (1900 to 1906), and that the proportionate mortality from consumption among 1530 cigarmakers and packers (1897 to 1906) was 28.9 per cent. against the same 14.8 per cent. His conclusion, based on a study of the literature and the above figures, was that tobacco workers were subject to an excessive mortality from consumption and from other respiratory diseases.

Kober[12] has stated that recent United States statistics show that among twenty-three occupations tabulated cigarmakers and tobacco workers occupy second rank in mortality from tuberculosis. The proportionate mortality from tuberculosis of the lungs among cigarmakers and tobacco workers compared with that in all occupations and in other specified occupations in the registration states (1909), by age groups, is presented in Table I.[21]

TABLE I.

Age at death, years.	Cigar and tobacco workers.	Physicians and surgeons.	Marble and stone-cutters.	Printers.	All occupations.
25 to 34 . .	49.3	21.2	46.7	51.5	31.0
35 to 44 . .	33.7	15.8	41.0	32.6	23.6
45 to 54 . .	23.2	9.2	42.9	22.3	14.4

The gastro-intestinal symptoms of tobacco workers were emphasized by Thiele,[22] who claimed that the volatile oil and the nicotin of tobacco irritated the throat, producing cough, nausea, and vomiting. Nausea, diarrhea, and increase in gastric acidity were spoken of in Ramazzini's[1] original paper, while Chapman[23] described abdominal pain, constipation, and collapse. Rosenfeld[11] found 11.6 per cent. of the Austrian tobacco workers to be suffering from some gastro-intestinal disturbance, whereas the percentage for textile workers was 8.5, and Jehle[24] found similar disturbances in 20.7 per cent.

of tobacco workers, but in only 11 per cent. of other workers. Thompson[25] described gastro-intestinal as well as nervous and vascular symptoms, but did not rate the occupation as especially hazardous.

Anemia has been considered by many to be a result of tobacco work, and Rosenfeld[11] suggested a specific action of tobacco in its production. He found anemic 1.92 per cent. of cigar workers as against 0.77 per cent. of all workers, and Jehle[24] found 7.81 per cent. of tobacco workers with anemia, while other workers showed only 2.81 per cent. Thiele[22] and Bresler[26] believed that these workers suffered from anemia, and the latter attributed their pelvic disturbances to this condition.

Menorrhagia was noted among tobacco workers by Patisier, Richardson, James, Kostial, Morat and Brodie, according to the New York Factory Investigating Commission,[27] and Rosenfeld[11] claimed that menstrual disorders were twice as frequent in these as in other workers; but Poisson,[28] Joire,[29] Piasecki,[5] and Oliver,[8] did not regard tobacco as an emmenagogue. Petit,[30] however, was able constantly to produce anatomical changes in the genital organs of animals by feeding them with tobacco, and Guillain and Gy[31] produced abortions in animals by the same means. In further support of its abortifacient effect Rosenfeld[11] found the percentage of miscarriages higher than in other women, while Emerson and Tracy[32] found the number of children in the families of tobacco workers quite small. Bresler[26] stated that it was known girls sought work in tobacco factories in order to bring about a termination of pregnancy, and Robinson[33] claimed that the most trifling genital lesion was enough to bring about an abortion in a tobacco worker. These facts suggested to Abelsdorf[18] that nicotin had a specific abortifacient effect, but Etienne,[34] Piasecki,[5] Ygonin,[35] Thiele,[22] and Oliver[36] believed that tobacco had no such influence. Etienne,[34] however, found the infant mortality to be twice that of other families, and he as well as Kostial[37] and Abelsdorf[18] suspected that this was due to the presence of nicotin in the mother's milk. Oliver,[36] on the other hand, stated that in Madrid he saw women leave their work at a certain hour to suckle their children, and that it would be difficult to see stronger and better nourished babies anywhere.

Among the nervous symptoms mentioned by Ramazzini[1] were headache, migraine, and squeamishness, and he supposed that the brain was clouded and narcotized. Thiele[22] added dizziness, sleeplessness, fatigue, heaviness of the hands and feet, and hyperesthesias to this category of nervous symptoms. Strümpell[38] described a nicotin tabes. Caparelli[39] reported as a result of an intensive study of twenty-five workers in tobacco fermenting rooms a heightened blood-pressure and an influence upon cardiac rhythm.

THE CIGAR INDUSTRY IN PHILADELPHIA. During the fifteen-year period (1899 to 1914) 130 establishments for the manufacture

of tobacco products in Philadelphia either shut down or combined with other plants, but during the same time the number of employees and the value of the products increased, as Table II shows. This was due to the organization of large companies and their ability to buy the raw material and produce the cigars more economically, thus forcing out the small companies and the individual manufacturers.

TABLE II.—MANUFACTURES OF TOBACCO, CIGARS, AND CIGARETTES IN PHILADELPHIA.

Census.	Number of establishments.	Number of employees.	Total value of products.
1899[40]	556	6960	$8,991,000
1904[40]	617	6710	8,655,000
1909[40]	496	7634	13,429,000
1914[41]	426	7982	12,733,281

If the proportion of cigar workers among all the tobacco employees of the city in 1914 was the same as that given by the 1905 census of manufactures for the entire United States there were in that year 6512 of the former in Philadelphia, and the number has probably changed very little in the past two years. Almost one-half of this number, 3199, were employed in the seven factories in which we made the examinations here reported, and a greater number are included in our paper upon the hygiene of the industry. Only 400 of these, however, were subjected to our study, and they were distributed among the factories, according to processes, as is shown in Table III. A detailed description of these processes is given in the paper by Smyth and Miller.

TABLE III.—DISTRIBUTION AMONG EMPLOYERS BY SEXES AND BY PROCESSES.

Employer.	Males.				Females.				All workers.
	Cigar-makers.	Packers.	Driers.	Casers.	Cigar-makers.	Packers.	Strip-pers.	Banders.	
T. . .	33	12	11	9	23	11	11	3	113
S. . .	2	4	0	0	34	13	0	6	59
M. . .	0	0	0	0	0	33	20	0	53
B. . .	0	0	3	0	0	5	0	5	13
J. . .	0	0	0	0	19	9	18	0	46
L. . .	17	2	0	0	19	2	0	0	40
R. . .	5	0	0	0	62	0	2	7	76
Total	57	18	14	9	157	73	51	21	400

Mode of Investigation. Although the method of conducting this investigation did not differ fundamentally perhaps from that of similar studies in other industries a statement of it is deemed

appropriate. From a list[42] of 160 establishments for the manufacture of cigars in the city we selected 25 of the larger ones, and by means of a circular letter requested their coöperation in this study. These factories were then visited and the nature of our proposed investigation more fully explained. When we were able to talk to the superintendents or to employers who had themselves grown up in the business we found a ready welcome and a desire to coöperate; when, however, employers who had not had actual experience as employees in the industry were encountered some objections were raised, the chief one being that the employees would not permit such a study. In a few of these instances, however, a trial was permitted, and in these, as in all the factories where we once came into contact with the workers, we had no further difficulties.

The employers were in every instance most courteous, and our hearty thanks are due them for the facilities which they put at our disposal. The superintendents always brought the matter to the attention of the workers, and, as a rule, only a few would consent to the examination at first; but after a start was made there was little difficulty in seeing as many as we could examine. Our plan was for the social service worker[43] to see the subject first and to elicit the social and industrial history, and then to pass the worker on to the examiner, who in turn procured the medical history and made as complete a physical examination as was possible. In many instances this meant an examination of the entire body, but sometimes it meant, on account of the semipublicity of the examining room, that the lower chest and abdomen had to be omitted. Fifteen to thirty minutes were required for each individual. Blood-pressure readings were taken and urines and blood smears examined when there was any suspicion of abnormality, while on about 100 girls the blood-pressure was determined routinely, and blood smears from 50 consecutive subjects were studied.

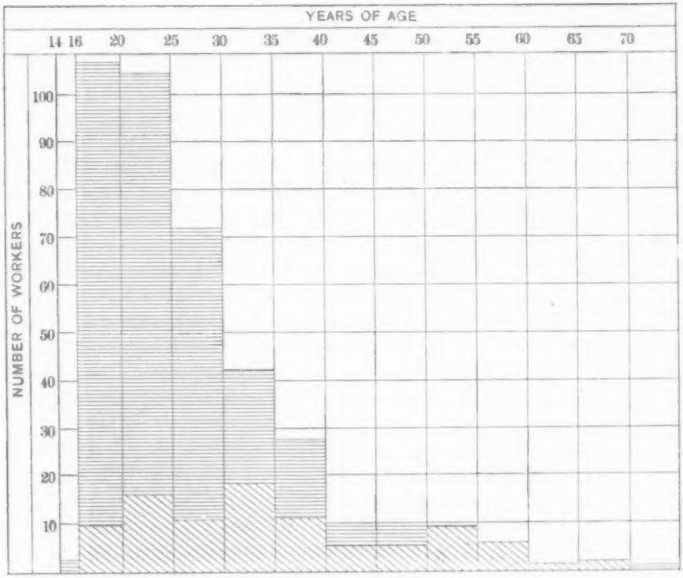
Analysis of Data upon Workers. *Sexes and Ages.* Of the 400 cigar workers included in this study 98 were males and 302 were females. Of the latter 157 were cigarmakers,* 73 packers, 51 strippers,† and 21 banders; whereas of the males, 57 were cigarmakers, 18 packers, 14 driers, and 9 casers. Table IV shows that 54.2 per cent. of them were under twenty-five years of age and 82.7 per cent. under 35. This large proportion in the early age groups is due to the female workers, since 63.5 per cent. of them were under twenty-five and 92.1 per cent. under thirty-five, while only 25.5 per cent. of the males were under twenty-five and 54.1 per cent. under thirty-five. This is shown graphically in the Chart.

* In this group of cigarmakers are included both bunch makers and rollers and both machine and hand workers.

† Applies to selectors and strippers together.

TABLE IV.—PERCENTAGE OF DISTRIBUTION, BY AGE GROUPS, ACCORDING TO SEXES AND PROCESSES, AND FOR ALL WORKERS.

Years.	Males.					Females.					All workers.
	Cigar-makers.	Pack-ers.	Dri-ers.	Casers.	Total.	Cigar-makers.	Pack-ers.	Strip-pers.	Band-ers.	Total.	
14–15	..	..	..	..	..	..	4.1	..	..	0.9	**0.7**
16–19	12.3	5.6	7.1	..	9.2	26.7	38.4	39.3	42.9	32.8	**27.0**
20–24	14.0	33.4	14.3	..	16.3	36.4	28.7	13.7	23.8	29.8	**26.5**
25–29	12.3	5.5	7.2	11.1	10.2	21.6	20.5	17.6	14.3	20.3	**17.8**
30–34	24.5	11.1	7.1	11.1	18.4	9.6	5.5	7.8	9.5	8.3	**10.7**
35–39	12.2	5.0	14.3	22.2	12.3	3.2	2.8	11.8	4.8	4.6	**6.5**
40–44	5.3	5.6	7.2	11.2	6.1	1.3	..	3.9	..	1.3	**2.5**
45–49	5.3	5.0	7.1	11.1	6.1	0.6	..	3.9	4.7	1.3	**2.5**
50–54	5.3	16.7	14.3	11.1	9.2	..	..	2.0	..	0.3	**2.5**
55–59	1.8	11.1	7.2	22.2	6.1	..	..	..	..	..	**1.5**
60–64	1.8	..	7.1	..	2.0	..	..	..	..	..	**0.5**
65–69	3.5	..	7.1	..	3.1	..	..	..	..	..	**0.7**
70–74	..	..	..	..	..	0.6	..	..	..	0.4	**0.3**
Unkn.	1.7	..	..	..	1.0	..	..	..	..	..	**0.3**
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No.	57	18	14	9	98	157	73	51	21	302	400



Number of workers in age groups by sexes. The oblique lines represent males and the horizontal lines females.

Length of Employment. The average duration of employment in the industry would then be expected to be much greater for the males, and Table V shows this to be the case. The single longest stay in the trade, however, was that of a woman who had worked as a cigarmaker for sixty-five years. The number of years of employment in the particular factory in which examined also averaged greater for the males. The cigarmakers had been longer in the industry than the workers in any other process, with the packers occupying second position among the males and the strippers among the females. Since these are the processes requiring the greatest amount of skill it is but natural that the workers should have stayed longest in them.

TABLE V.—AVERAGE LENGTH OF TIME IN THE INDUSTRY AND IN THE FACTORY IN WHICH EXAMINED.

Years.	Males.					Females.				
	Cigar-makers.	Packers.	Driers.	Casers.	Average.	Cigar-makers.	Packers.	Strippers.	Banders.	Average.
In the industry . .	17.0	14.6	11.8	7.3	14.8	6.9	4.4	6.8	5.1	6.3
In the factory in which examined . . .	5.2	5.8	8.4	2.2	5.3	2.6	3.4	2.7	3.0	2.8

Nativity. A tabulation of the nativity records shows that more than half, 55.5 per cent., were born in the United States, although among 14,356 cigar workers in this country in 1913 only 21.09 per cent. were American.[42] Russia and Austria-Hungary were the most frequent native countries of the foreign-born, and with America included 81 per cent. of the total. Of their fathers only 24.7 per cent. were born in the United States, and of their mothers 26.5 per cent., yet the order of frequency of the birthplace of the parents followed roughly that of the workers, except that Germany occupied a relatively higher position with the parents, and that Ireland, Belgium, Bulgaria, Spain, and Switzerland were represented among the parents but not among the workers themselves. According to religion Roman Catholics predominated with 45.2 per cent., Protestants and Jews being about equally divided among the others.

Civil Condition. An analysis of the civil or conjugal condition reveals that 60.5 per cent. were single, and this is to be explained by the preponderance of the subjects in the early age groups. The older ages of the men accounted for 63.2 per cent. of them being married, whereas only 29.5 per cent. of the females were or had been married. These figures may be compared with those for 13,743 cigar workers in this country in 1913, among whom 57.88 per cent.

of the males were married and 20.11 per cent. of the females.[42] Among the women more of the strippers than of any of the other process groups were married, and this also is due to their older age distribution.

Earnings and Hours of Work. Piece rates prevailed with all the employees except the driers and casers, and the differences in the earnings of the sexes were slight. The cigarmakers of the seven factories averaged $14 to $18 per week of fifty-four hours, the packers $16, the driers $10 to $11, the casers $14, the strippers $8 to $10, and the banders $9 to $10. It was not uncommon to find a cigarmaker earning $25 per week, and one young girl who did machine-cigarmaking earned $30 regularly. These figures are in strong contrast with those presented by the United States Commissioner of Labor[44] in 1913, when as the result of the compilation of statistics for 13,565 cigar workers, including those from nine factories in Pennsylvania, he stated that half of the females and one-twelfth of the males earned under $6 per week, and that only one-tenth of the women and three-fourths of the men made over $10 per week. In addition to the large increase in all wages since that time it is probable that a better grade of cigars are made and consequently better wages are paid in the factories here considered than in the industry generally.

In this connection, too, it is to be remembered that many of the workers whom we studied seldom did full-time work of nine and three-quarter hours per day and fifty-four hours per week. The packers never work late in the afternoons or on dark days because of inadequate light, and it is the habit of some workers in other processes to come late in the mornings, to take extra time at the lunch period, and at times to leave early in the afternoons. Some do this because of home duties and others only because they are allowed to. It is of interest that some of the best-paid employees were these short-day workers.

Menstruation and Fecundity. The great divergence of opinion and the paucity of actual data in the literature on the effect of tobacco work upon the menstrual function indicated the importance of careful questioning in regard to this matter. Among 296 females so questioned we secured a history of dysmenorrhea in 42, of menstrual irregularities in 17, and of menorrhagia in only 2, while in 232 we obtained perfectly normal histories. These facts, with those for the individual processes, are presented in percentages in Table VI. It will be observed that in each group at least 75 per cent. of the histories were normal, thus suggesting that tobacco does not have a harmful influence upon this function.

The claim which has been made repeatedly, and which was apparently supported by Emerson and Tracy's[33] findings in New York, that women who work in tobacco give birth to few children, also suggested some inquiries along this line. Among 93 married

women we found only 50 who had ever given birth to a child, 53.8 per cent. (Table VII). The total number of children was only 95, this meaning an average of less than two to each mother and of about one to each married woman. Emerson and Tracy found in one group of 58 families an average of $1\frac{1}{7}$ to a family, and in another group of 53 families $1\frac{3}{4}$ to a family. While these figures seem convincing, they may at the same time be misleading, inasmuch as the superintendents whom we questioned about this were of the opinion that the cause lay in the frequent use among these people of means for the prevention of conception and in induced abortions. Furthermore, they were able to tell us of many families in which the mother worked in tobacco and in which there were the usual number of children. It will be noted that the statements of miscarriages, as also presented in Table VII, are not excessive.

TABLE VI.—MENSTRUAL HISTORIES OF 296 FEMALE WORKERS ACCORDING TO PROCESSES AND AS A WHOLE, IN PERCENTAGE AFFECTED.

Condition.	Cigar-makers.	Packers.	Strippers.	Banders.	All workers.
Dysmenorrhea	13.5	12.7	16.3	20.0	14.2
Irregularities	7.7	4.2	..	10.0	5.7
Amenorrhea	2.6	2.8	2.0	..	2.4
Menorrhagia	..	..	4.1	..	0.7
Normal	77.0	83.0	77.5	75.0	78.4
Number	156	71	49	20	296

TABLE VII.—FECUNDITY OF 93 MARRIED WOMEN ACCORDING TO PROCESSES AND AS A WHOLE.

	Cigar-makers.	Packers.	Strippers.	Banders.	All workers.
Number	51	12	24	6	93
Percentage having borne children	55.0	50.0	50.0	66.6	53.8
Average number of children per married woman	1.08	0.83	1.0	1.0	1.02
Average number of children per mother	1.96	1.67	2.0	1.5	1.9
Average number of miscarriages per married woman	0.31	0.08	0.04	0.17	0.2

Past Medical and Operative History. The past medical histories revealed only that these workers had suffered from the usual diseases of childhood and adolescence. Measles had occurred in 55 per cent. of them, tonsillitis in 24, whooping-cough in 22.7, mumps in 19.2, and typhoid fever in 11 per cent. Influenza, scarlet fever, and diphtheria had each occurred in a little more than 10 per cent. Only the men were questioned as to gonorrhea and syphilis, and of these 12 admitted the Neisserian infection and 3 lues. The past operative histories indicated that tonsillectomies

and appendectomies were most frequent, and that the proportion of operations upon the men was less than half that upon the women. Among the latter there were 6 laparotomies for pelvic conditions and 6 uterine dilatations and curettements.

Weights and Measurements. The weights and certain anthropometric measurements were secured in each individual and the averages of these for the workers in each process, by sexes, together with general averages for each sex, are presented in Table VIII. It is appreciated that these figures are of little value except as they may be compared with similar observations upon workers in other industries, and it is hoped that we may at some time have such data upon all occupations.

TABLE VIII.—AVERAGE ANTHROPOMETRIC WEIGHTS AND MEASUREMENTS, BY SEXES, IN EACH PROCESS WITH GENERAL AVERAGES.*

	Males.					Females.				
	Cigar-makers.	Pack-ers.	Driers.	Casers	Aver-age.	Cigar-makers.	Pack-ers.	Strip-pers.	Band-ers.	Aver-age.
Weight	62.4	64.9	64.1	67.1	63.5†	58.0	54.8	61.0	56.6	57.6†
Height	169.6	169.1	169.0	166.0	169.3†	160.6	162.7	161.1	159.3	161.2†
Breadth of shoulders	38.2	39.2	39.1	39.6	38.7	36.2	35.9	36.9	36.1	36.2
Breadth of chest	26.5	26.9	27.3	28.3	26.9	25.3	24.6	24.3	25.5	25.0
Breadth of waist	25.4	25.8	27.2	28.2	26.0	22.3	21.6	22.8	22.0	22.2
Breadth of hips	32.1	32.1	33.7	33.8	32.5	34.1	33.3	34.0	33.0	33.8
Depth of chest	19.4	19.4	20.9	21.7	20.0	18.3	18.5	17.2	18.8	18.2
Depth of abdomen	19.1	19.8	20.5	22.0	19.9	18.0	18.2	18.1	18.5	18.1
Girth of neck	35.1	35.2	35.7	34.9	33.0	31.7	31.1	32.0	31.2	31.6
Girth of chest contracted	84.8	85.1	91.7	89.5	86.1	80.8	79.4	80.8	82.7	80.6
Girth of chest expanded	91.2	92.0	97.0	94.6	92.4	85.8	85.5	87.3	87.3	86.1
Girth of waist	77.7	79.3	83.5	83.6	79.3	70.3	69.2	75.2	70.0	70.9
Girth of hips	92.3	94.2	96.6	93.9	93.9	97.5	95.1	102.6	97.0	97.7
Number	57	18	14	9	98	157	73	51	21	302

Build, Posture, Nutrition and Development. In regard to build, posture, nutrition, and development it is possible to record only the examiner's impressions, and these are stated in Table IX. It will be noted that in each instance the figures are better for the women than the men, but it must not be forgotten that the men

* Weights are expressed in kilograms and measurements in centimeters.

† 63.5 kg. = 140 pounds; 57.6 kg. = 127 pounds; 169.3 cm. = 66.7 inches; 161.2 cm. = 63.4 inches.

represent older age groups. Attention is also called to the fact that the driers and casers have the poorest build and posture but the best development; the explanation probably lies in their doing heavier manual labor than the others.

TABLE IX.—BUILD, POSTURE, NUTRITION AND DEVELOPMENT IN PERCENTAGE OF THE WORKERS IN THE SEVERAL PROCESSES, IN EACH SEX, AND IN THE TOTAL NUMBER.

BUILD.

	Males.					Females.					Total.
	Cigar-makers.	Pack-ers.	Driers.	Casers.	Total.	Cigar-makers.	Pack-ers.	Strip-pers.	Band-ers.	Total.	
Good	56.2	53.0	46.2	44.4	53.1	55.7	64.4	70.6	66.6	61.1	59.2
Fair	42.1	29.4	46.2	44.4	40.7	43.0	34.2	27.4	33.4	37.6	38.3
Poor	1.7	17.6	7.6	11.2	6.2	1.3	1.4	2.0	..	1.3	2.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

POSTURE.

Good	63.1	61.1	35.7	44.4	57.2	71.2	72.2	60.8	76.2	70.0	66.8
Fair	19.3	22.2	21.4	33.4	21.4	21.8	22.2	31.4	23.8	23.7	23.1
Poor	17.6	16.7	42.9	22.2	21.4	7.0	5.6	7.7	..	6.3	10.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NUTRITION.

Good	52.6	50.0	69.2	66.6	55.1	65.6	67.1	68.7	66.6	66.5	64.0
Fair	42.1	33.3	23.1	33.4	37.1	24.8	30.1	25.5	33.4	26.8	29.3
Poor	5.3	16.7	7.7	..	7.2	9.6	2.8	5.8	..	6.7	6.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

DEVELOPMENT.

Good	50.9	37.5	92.3	87.5	56.8	61.0	59.4	60.8	81.0	62.0	60.7
Fair	42.1	56.3	7.7	12.5	36.9	37.1	33.4	35.2	19.0	34.6	35.2
Poor	7.0	6.2	..	..	6.3	1.9	7.2	4.0	..	3.4	4.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No.	57	18	14	9	98	157	73	51	21	302	400

Physical Findings. The physical findings in percentages for the various groups are set forth in Table X. Congestion of the conjunctival mucous membrane was most frequent, and it was of such a grade as to suggest some cause inherent in the industry as at present conducted. It was observed that those who wore glasses were not so frequently affected, and this indicated a method by which this finding could be obviated. This subject will be amplified in a subsequent publication by T. B. Holloway, who made careful and exhaustive studies upon the eyes of some of these workers.

TABLE X.—PHYSICAL FINDINGS IN WORKERS, IN PERCENTAGE, ACCORDING TO SEXES AND PROCESSES AND AS A WHOLE.

	Males.					Females.					All workers.
	Cigar-makers.	Packers.	Driers.	Casers.	Total.	Cigar-makers.	Packers.	Strippers.	Banders.	Total.	
Conjunctival congestion	65.4	72.2	64.4	77.8	64.4	46.6	67.1	64.8	76.2	56.6	**58.5**
Dental caries	36.6	39.0	93.0	77.8	47.0	33.1	38.4	45.1	38.1	36.8	**39.2**
Dental wearing	54.0	16.7	28.6	33.4	38.8	40.8	..	15.7	..	23.9	**27.5**
Dental insufficiency	17.3	27.8	50.0	55.6	26.6	11.5	21.9	15.7	14.3	14.8	**17.7**
Pyorrhea	15.4	33.4	71.5	22.2	26.6	8.9	..	7.8	4.8	6.3	**11.2**
Tremors of eyelids	19.2	33.4	7.1	33.4	20.4	40.8	54.8	43.2	28.6	43.7	**38.0**
Palpable glands:											
Axillary	55.8	72.2	52.2	55.6	56 2	31.8	23.3	3.9	23.8	24.5	**32.2**
Cervical	30.8	39.0	42.9	33.4	32.7	13.4	27.4	9.8	4.8	15.6	**19.7**
Epitrochlear	36.6	39.0	42.9	55.6	37.8	1.3	1.4	..	4.8	1.3	**10.2**
Pharyngeal congestion	38.4	50.0	71.5	33.4	42.9	14.0	11.0	31.4	..	15.2	**22.0**
Tonsils:											
Diseased	11.5	11.1	14.3	..	10.2	17.8	9.6	15.7	19.0	15.6	**14.2**
Enlarged	5.8	5.6	7.1	11.1	6.1	21.7	9.6	7.8	9.5	15.6	**13.2**
Hyperactive reflexes	5.8	..	..	..	3.1	7.6	32.9	11.8	9.5	14.6	**11.7**
Lungs: suspicious infiltration:											
Right apex	11.5	16.7	21.4	..	12.3	8.3	16.4	11.8	14.3	11.3	**11.5**
Left apex	3.8	5.6	..	..	3.1	1.3	2.7	2.0	4.8	1.9	**2.2**
Apical fibrosis	1.9	5.6	7.1	..	3.1	1.3	..	2.0	..	1.0	**1.5**
Emphysema	5.8	..	14.3	..	5.6	0.6	..	..	..	0.3	**1.5**
General fibrosis	3.8	5.6	..	22.2	5.6	..	..	..	..	..	**1.2**
Thyroid fulness	..	..	..	..	..	5.7	12.3	3.9	14.3	7.6	**5.7**
Heart:											
Mitral murmur:											
Systolic	..	..	28.6	22.2	6.1	2.5	9.6	2.0	9.5	4.6	**5.0**
Presystolic	..	..	..	..	..	0.6	..	3.9	..	1.0	**0.7**
Aortic systolic murmur	..	..	..	..	..	..	..	..	4.8	0.3	**0.2**
Pulmonic murmur	..	..	..	..	..	..	4.1	3.9	..	1.7	**1.2**
Weak heart sounds	11.5	5.6	..	..	7.1	1.3	..	..	9.5	1.3	**2.7**
Arrhythmia	..	..	..	..	..	0.6	4.1	3.9	..	2.0	**1.5**
Arteriosclerosis	11.5	5.6	21.4	..	10.2	..	..	..	..	..	**2.5**

Various dental abnormalities occupy second place in our classification. There were 157 who showed gross dental caries, and 110, or 27.5 per cent., presented a wearing away of the biting and grinding surfaces of all their teeth, such as is seen in men who have chewed tobacco for a long time. It is interesting that this occurred in the females as well as in the males, but that among the women it was seen only in those working in processes in which tobacco could be placed in the mouth, the cigarmaking and stripping departments. The banders and packers handle only finished cigars and so have no opportunity of getting tobacco into the mouth,

and none of the females in these processes showed dental wearing. Among the men instances were found in every process, but the men handle raw tobacco in all their departments, and even when their teeth do not aid them in their skilled work they keep tobacco in their mouths. Some, even of the girls, after a year or less of work in tobacco will show this dental wearing; and some of those who have worked five or more years and who constantly use their teeth show the latter worn almost half down to the gum margins. The tobacco contains a certain amount of gritty material, sand and organic matters, and it seems likely that enough of this gets upon the teeth, even by licking the binders and wrappers, to slowly grind down the biting and chewing surfaces when they are approximated, as might emery. A second factor in its production may be simply the biting together of the teeth, as in biting out bunches. Seventy-one of the workers showed what we have arbitrarily termed an insufficiency of teeth, indicating a loss of five or more. Pyorrhea was present in 11.2 per cent.

Because of the significance which some clinicians attach to tremors of the eyelids when lightly closed as indicative of neurotic conditions data were secured upon the presence of this phenomenon, showing 38 per cent. to be so affected. Hyperactive reflexes might be expected to correspond roughly with the presence of these tremors if they are suggestive of a neurotic state, but were found in only 11.7 per cent.

The pharynx was congested in 22 per cent., and in some it was quite dry and glistening. As many of the workrooms have a low humidity with a somewhat high temperature, and as tobacco dust is quite hygroscopic, this finding is readily explained. The banders work in the cleanest, the least dusty, and the best ventilated rooms, as is shown by Smyth and the writer, and among these there was not found a single instance of pharyngeal catarrh.

Abnormal tonsils were discovered in 27.4 per cent. of the employees examined. In 13.2 per cent. the tonsils were simply enlarged, while in 14.2 per cent. they were cryptic and diseased.

It is very difficult to differentiate between normal and slightly abnormal findings in the lungs, and if we have erred in this regard we believe that it has been in placing too many in the abnormal or doubtful class. Although the predominance of right-sided apical lesions presented in our table suggests that we have done this, our figures nevertheless represent our impressions at the times of the examinations. We found 46 with what we considered slight right apical pulmonary infiltration and 9 with the same on the left side. In none of these did we get rales and none had sputum. In 6 other instances the signs of old inactive apical infiltration were unquestionable, 3 in males and 3 in females. Emphysema was noted 6 times, and signs of a general fibrosis 5 times; all the latter were men.

Heart examinations revealed a mitral systolic murmur in 20 instances, weak heart sounds in 11, an arrhythmia in 6, a pulmonic

systolic murmur in 5, a mitral presystolic murmur in 3, and 1 aortic systolic murmur. In no case was decompensation present. No instances of marked arteriosclerosis were detected, but a few of the workers showed it in mild degree.

Blood-pressure studies were made upon 147 employees, using the auscultatory method, and the averages are presented in Table XI. The lowest average systolic reading for any group was 118 for the female cigarmakers and the highest 131 for the casers. All the diastolic averages ranged between 73 and 85.

TABLE XI.—BLOOD-PRESSURE AVERAGES ON 147 WORKERS.

	Males.					Females.				
	Cigar-makers.	Packers.	Driers.	Casers.	Total.	Cigar-makers.	Packers.	Strippers.	Banders.	Total.
Number studied . .	30	14	11	9	64	78	33	27	9	147
Average systolic pressure	124	130	130	131	128	118	121	127	127	121
Average diastolic pressure	80	82	80	73	81	78	82	85	74	81

Diagnosis. Some of the physical conditions presented in Table X, such as dental caries and diseased tonsils, constitute in themselves diagnoses, but others can be so interpreted only in the light of the clinical history and examinations in the individual worker. The latter conditions, such as pulmonary infiltration and thyroid fulness, have been reconsidered in this light and in those instances where diagnoses seemed justified they were recorded and are presented separately in Table XII. This table also includes such other diagnoses as we have been able to make. Because of our limited study some of these are only symptoms, but insofar as possible we are presenting etiological diagnoses.

Chronic constipation stood first among the diagnoses, being present in 19.2 per cent. of the total number. It was most frequent in the females, and among them most often in the cigarmakers and the strippers. The packers, who stand constantly at their work, showed only a slightly lower percentage than the strippers among the females, but there was none among the male packers. The banders showed the lowest percentage, although they sit at their work.

Headaches, exclusive of those due to menstrual or other transient conditions, were complained of 45 times. Among the females 13.7 per cent. suffered in this way as against 5.1 per cent. among the males. Some of them were no doubt due to eye-strain, as was suggested by several of the girls telling us of similar headaches which they had had and which disappeared after they had been glassed. All of these workers with obscure headaches were advised to secure eye examinations; and we have records of a few in which

this was done and refractive errors were found. It is possible that some of the headaches were due to fatigue or the toxic effect of tobacco, but of this we have no proof.

TABLE XII.—DIAGNOSES, ACCORDING TO SEXES AND PROCESSES, IN PERCENTAGE OF WORKERS AFFECTED.

Diagnoses.	Males.				Females.				All workers.
	Cigar-makers.	Packers.	Driers.	Casers.	Cigar-makers.	Packers.	Strippers.	Banders.	
Constipation	8.8	..	7.1	22.2	31.2	15.1	15.7	4.8	19.2
Apparently normal	12.3	16.7	..	11.1	8.9	16.4	21.6	4.8	12.2
Headache	7.0	..	7.1	..	13.4	5.5	7.8	52.4	11.2
Gastric neurosis	3.5	..	14.3	22.2	11.5	4.1	2.0	..	7.0
Neurasthenia	3.5	5.6	..	..	7.0	2.7	4.0	..	4.4
Slight hypertension	..	5.6	..	..	0.6	8.2	5.9	4.8	3.0
Pelvic inflammation	..	..	..	..	3.2	4.1	7.8	..	3.0
Secondary anemia	..	..	..	..	3.8	1.4	5.9	..	2.5
Backache	3.5	..	..	..	1.3	..	..	9.5	1.5
Conjunctivitis	..	..	7.1	..	1.9	..	..	9.5	1.5
Arrested pulmonary tuberculosis	1.8	5.6	7.1	..	1.3	..	2.0	..	1.5
Questionable active pulmonary tuberculosis	1.8	5.6	..	..	1.3	2.7	..	..	1.2
Vasomotor neurosis	1.8	5.6	..	..	1.9	..	..	..	1.2
Chronic appendicitis	..	..	..	11.1	1.3	1.4	..	..	1.0
Chronic bronchitis	5.3	..	..	..	..	..	2.0	..	1.0
Eczema	1.8	..	..	..	1.9	..	..	..	1.0
Pregnancy	..	..	..	..	1.3	1.4	..	..	0.7
Toxic goitre	..	..	..	..	1.9	..	..	..	0.7
Early nephritis	..	..	..	..	0.6	1.4	..	4.8	0.7
Brachial neuritis	1.8	..	..	..	1.3	..	..	..	0.7
Acne vulgaris	1.8	..	..	..	0.6	..	2.0	..	0.7
Blepharitis	1.8	..	..	..	0.6	..	..	..	0.5
Gastroduodenal ulcer	3.5	..	..	..	..	..	..	..	0.5
Bronchial asthma	1.8	..	..	..	..	1.4	..	..	0.5
Cirrhosis of liver	3.5	..	..	..	..	..	..	..	0.5
Sacro-iliac strain	1.8	..	..	..	..	..	2.0	..	0.5
Urethral stricture	3.5	..	..	..	..	..	..	..	0.5
Intestinal adhesions	..	..	..	..	0.6	..	..	..	0.2
Toxic arthritis	..	..	..	..	..	1.4	..	..	0.2
Cholelithiasis	..	..	..	..	0.6	..	..	..	0.2
Epididymitis	1.8	..	..	..	..	..	..	..	0.2
Angina pectoris	1.8	..	..	..	..	..	..	..	0.2
Frontal sinusitis	..	..	..	..	0.6	..	..	..	0.2
Paresis of right external rectus	..	..	..	..	0.6	..	..	..	0.2
Trachoma	..	5.6	..	..	..	..	..	..	0.2
Number	57	18	14	9	157	73	51	21	400

Among the gastric neuroses we have grouped all those instances of gastric disturbance in which we did not believe that there was an organic lesion. In spite of the high percentage of such cases reported by others we found only 7 per cent. to be so affected, and none of these showed a marked disturbance. The diagnosis of gastroduodenal ulcer was twice made.

A secondary anemia was found ten times. The diagnosis was based upon the history, the physical appearance, and a study of blood smears. No hemoglobin estimations were made because of the difficulties of making accurate determinations under the circumstances of our work.

Backache was complained of by only 6 workers, of whom 4 were cigarmakers and 2 banders. Although many seemed to sit in strained positions there were backs to most of the seats, and this was doubtless a large factor in eliminating this complaint. In only 2 instances could a diagnosis of sacro-iliac strain be made.

Old inactive tuberculous lesions of the lungs were discovered 6 times, and active pulmonary tuberculosis was suspected in 5 of the 55 individuals in whom there were questionable physical signs of apical infiltration. In these 5 the physical signs alone were little more conclusive than in the others, and none had sputum, but some had a slight temperature elevation and all of the 5 were losing weight, were anemic, or had vague gastric disturbances. This small number of instances of tuberculosis agrees with Dembo's[45] finding of only 8 in her examination of 600 female tobacco workers, and with her cases gives a percentage of 1.3 for 1000 tobacco workers. In view of this small proportion of tuberculous pulmonary infections among these workers it is difficult to understand the high mortality rate of tobacco workers from this cause. It is possible of course that in some of those in whom we found vague signs at one or the other apex, and whom, because they were without symptoms of any kind, we have not included in this grouping, death may finally occur from tuberculosis. Another possibility is that working conditions have greatly improved in recent years, and that it was these conditions rather than the tobacco itself which caused the high tuberculosis mortality.

Attention is called to the 4 cases of eczema observed, in only two of which, however, was the lesion upon the hands. Knowles[46] has seen 9 instances of eczema upon the hands and fingers of tobacco workers and thinks it is probably due to the irritating effects of nicotin.

Although 7.6 per cent. of all the females showed some fulness of the thyroid gland, in only three of them could we elicit any signs of thyroid intoxication, and these were slight and questionable. Our diagnoses have been limited to these 3 cases, 0.7 per cent. of the total number and 1 per cent. of the women.

Brachial neuritis, although very mild in type, was diagnosed 3 times, and in each instance it was in a cigarmaker. Two cases of arm pains and one of leg pains in cigarmakers were recently reported by the State Board of Labor and Industries of Massachusetts,[47] and Dr. David Edsall informs the writer that he has seen a number of other cases at his clinic in Boston. Inasmuch as all our cases and some of the others occurred in a single process it is probable that the neuritis is mechanical rather than toxic in origin.

In only 12.2 per cent. of the workers were we unable to find any defects or symptoms, and for these we have entered diagnoses of "apparently normal," recognizing that it is impossible to say with certainty what is normal.

CONCLUSIONS. 1. The literature upon the effects of working in tobacco favors the view that it predisposes the worker to pulmonary tuberculosis, gastro-intestinal disturbances, anemia, genital abnormalities, and nervous conditions.

2. In a study of the social and medical conditions of 400 cigar workers in Philadelphia we did not find support for any of these contentions.

3. We did find, however, some wearing of the teeth and some pharyngeal and conjunctival congestion, findings which we believe to be dependent upon faulty personal and factory hygiene.

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ELECTROCARDIOGRAPHIC OBSERVATIONS IN TOXIC GOITRE.

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The importance of cardiac signs and symptoms in exophthalmic goitre has been a matter of common knowledge since the earliest description of this disease by Parry[1] in 1786. Tachycardia, palpitation, forcible heart action, and less often cardiac arrhythmia are such important factors in the syndrome that Möbius[2] was led to the dictum that "Basedow patients suffer and die through their hearts." It is only within the past decade or so, however, that the cardiac symptoms have been generally considered as due to thyreotoxic influences, rather than wholly or in part due to embarrassment of the right heart following an often hypothetical pressure on the trachea by the enlarged thyroid gland. As this condition constitutes a relatively simple example of an endogenous intoxication, it has seemed advisable to study the changes produced in the electrocardiogram by the intoxication of this disease, with the additional hope that further light might be thrown both on the resulting cardiac condition and on the changes produced in it by surgical operations on the thyroid.

Method. To this end electrocardiograms were taken on 51 goitre patients seeking surgical relief, in as many cases as possible both before and at short and long periods after operation. Information was sought not only as to the rate and rhythm of the heart action in both simple and toxic goitre cases, but also as to the relative size of the chambers of the heart and to other changes in the form of the ventricular complexes of the electrocardiogram

both before and after operation. Endeavor was also made to correlate these findings with the changes observed in the clinical condition of the various subjects examined. On account of the nervous state of many of the patients, fine vibrations of the string were often unavoidable, and occasionally were sufficient to prevent accurate measurement of the P–R interval, but did not otherwise interfere with interpretation of records. A still greater handicap was imposed by ineradicable extraneous electrical disturbances which, together with the limitations of the Edelmann galvanometer, prevented the proper complete standardization of records. For this reason it has been impossible to base any deductions on the actual changes in the size of the ventricular complexes observed in a given case after thyroid removal, and only the relative shapes of the various complexes in the pre- and postoperative records could be considered. Time intervals, the diagnosis of existing arrhythmias, and the detection of right or left ventricular preponderance were, of course, not interfered with. Most of the cases here reported were from the clinic of Dr. C. H. Frazier, whom I take this opportunity to thank for placing them at my disposal.

Results. *Clinical.* The clinical data on the cases studied will be included in a table to be published later.

The usual preponderance of females, the relative youth of most of the cases, and the presence of the characteristic symptoms of the disease are all apparent. It is also obvious that almost all cases were of the toxic, hyperthyroid, or exophthalmic goitre type, and that this diagnosis was confirmed by pathological examination. Thirty-five of the patients submitted to partial thyroidectomy, 10 to artery ligation, and 2 to enucleation of adenomata. Of the ligation group 1 was greatly improved, 5 moderately so, 3 showed little or no improvement, and 1 died. In general this group did not tend to show as marked improvement as did those who had a partial excision. Although 3 of the latter failed to show any improvement after operation, it must also be remembered that many of the partial excision group had previously had arteries ligated, without sufficient improvement to obviate further surgical intervention.

Of the 47 cases, 7 were greatly improved by the operation, 23 were moderately improved, 14 only slightly or not at all improved, and 3 died. One of the deaths (Case No. 22) occurred two days after double lobectomy of a colloid goitre and was due to pneumonia complicated by increased thyrotoxicosis; another (Case No. 40) was due to cardiac failure twenty-four hours after ligation of a single artery. It is unfortunately true that in neither case were adequate premonitory signs evident either in the clinical examination or the electrocardiograms taken a few days before operation. The third case (Case No. 13), which had failed to improve after ligation of the superior thyroid artery, developed

negative *T* waves which were still present at the time of the second operation four months later. Her death from cardiac failure two

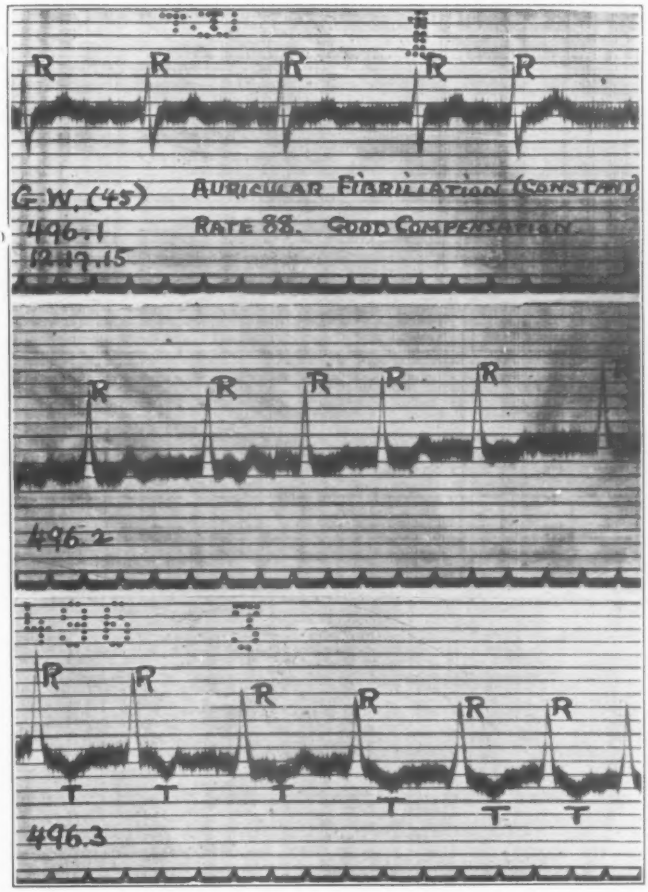

FIG. 1.—Case 45. Electrocardiogram of G. W., showing permanent auricular fibrillation. This and subsequent electrocardiograms were made with the Edelmann galvanometer. As the string could not be standardized with the patient in circuit, 1400 ohms were added as an arbitrary equivalent of the patient's resistance. Platinum strings were used with a resistance varying between 3500 and 5000 ohms. Time intervals are expressed at the bottom of each lead by $\frac{1}{5}$-second intervals. In this figure note (1) absence of sign of auricular contraction (*P* wave); (2) ventricular arrhythmia (irregular occurrence of *R*); (3) occasional fine waves of fibrillation.

days after the partial excision undertaken at this time tends to confirm the view that negative *T* waves, when not due to digitalis

medication, have an unfavorable influence on prognosis. The electrocardiogram of the patient that died from pneumonia showed abnormal *T* waves in Leads II and III, but similar abnormalities were found in 4 other cases (Cases 2, 3, 5, 35) that were improved by operation.

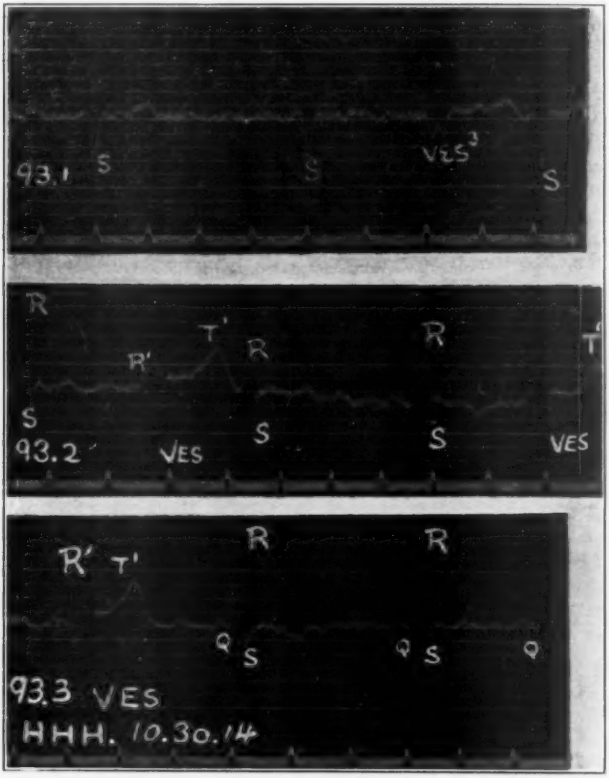

FIG. 2.—Case 24. Electrocardiogram of H. H. H., showing right ventricular preponderance, auricular fibrillation of probably ten years' duration, with occasional ventricular premature contractions arising from several sites. Note (1) that the *S* wave has replaced the *R* wave in Lead I and that the *R* wave of Lead III (R_3) is greater than the *R* wave of Lead II (R_2). Note also that (2) in each lead one or two complexes vary greatly from the normal supraventricular type, and that (3) the same disturbance of mechanism exists as in Fig. 1.

RHYTHM. Changes in cardiac rhythm were observed in 11 cases, as follows: sinus arrhythmia, 4 cases; ventricular extrasystoles, 3 cases; auricular fibrillation, 3 cases; auricular flutter, 1 case. The *P–R* interval was prolonged beyond normal limits in 2 cases. As no other adequate cause for such derangement of cardiac

mechananism was given in the past history of all but 2 of these cases, it is fair to assume that the majority, if not all, were caused by the thyreotoxicosis, acting not only by its direct toxic effect, but also indirectly through the cardiac hypertrophy and later degeneration

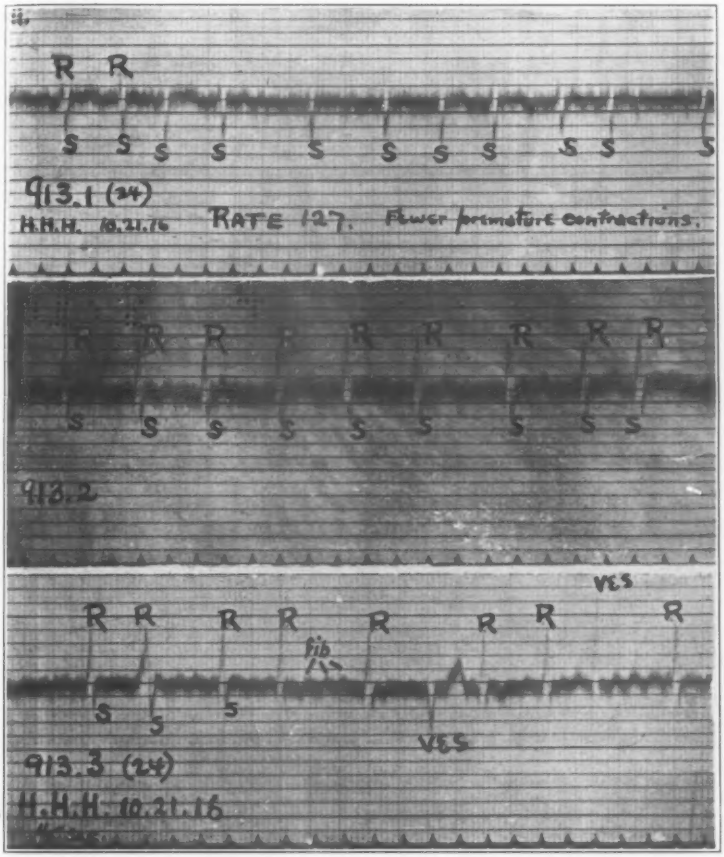

FIG. 3.—Electrocardiogram of same patient as Fig. 2, taken two years later, showing the same picture, except that the premature contractions occur much less frequently.

thus caused. The fact that most of the cases studied received energetic treatment relatively early in the disease will probably account for the comparative infrequency of the more important arrhythmias and of other gross cardiac changes in this series. This in its turn

emphasizes the value of early and thorough medical treatment, followed by prompt surgical intervention in those cases not responding properly to medical care.

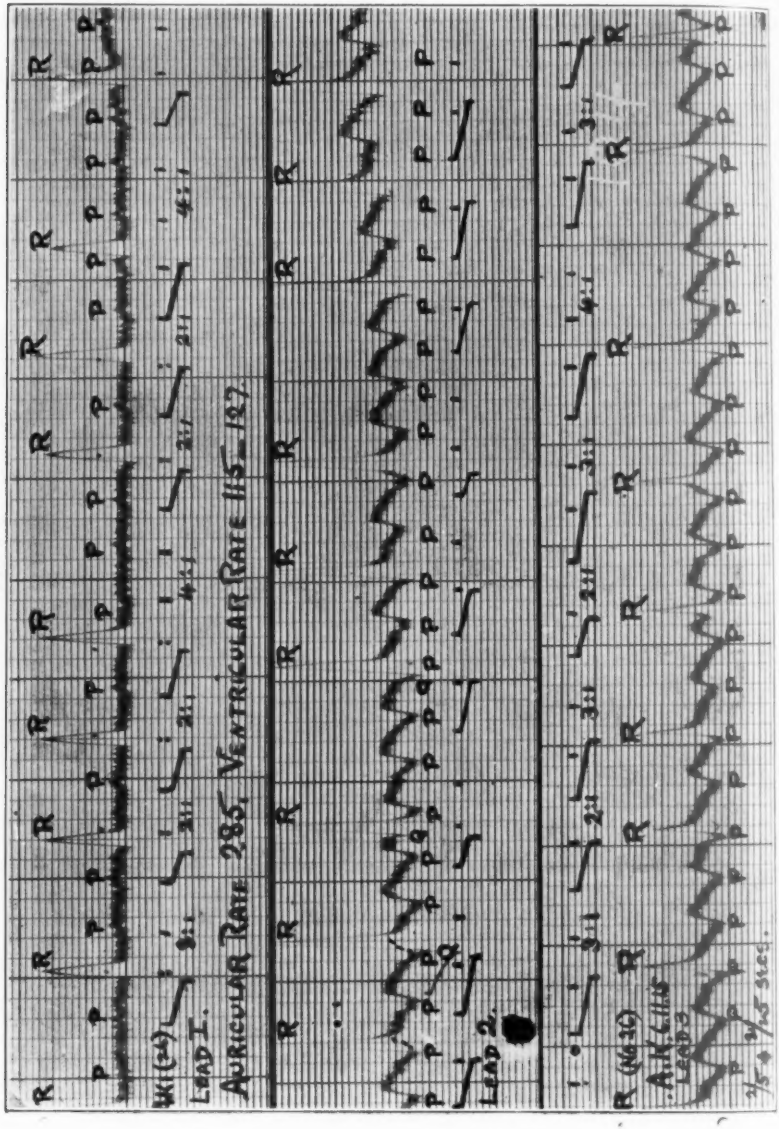

FIG. 4

The small number of arrhythmic cases affords but little opportunity to judge of the effects of operation on the arrhythmia. The case of flutter and two of the cases of fibrillation were undoubtedly permanent, having been followed over several years without change. Although many different attempts were made at different times to change the auricular flutter into fibrillation or normal rhythm all efforts proved unavailing. One of the cases of auricular fibrillation (Case 51) proved to belong to that interesting group of transient fibrillation, to which attention has elsewhere been called.[3] In Fahrenkamp's[4] series of cases of hyperthyroidism in which transient fibrillation was present the arrhythmia occurred in distinct paroxysms of short duration. In the present case, however, fibrillation was present when the patient was first seen eighteen months ago. On account of a coexisting mitral stenosis and the absence of data as to the time of origin of the arrhythmia it was thought at that time that an ordinary case of fibrillation with chronic mitral endocarditis was being complicated by hyperthyroidism. The fibrillation persisted apparently as a constant condition until about one month ago, when it was noted that coincident with general improvement the pulse had become regular. Electrocardiograms taken then and at various periods since then show that normal rhythm has now supervened. As this occurred coincident with improvement in the hyperthyroidism it is fair to assume that the thyroid and not the endocarditis was the chief factor in the production of the fibrillation.

Of the 3 cases exhibiting extrasystoles only 1 accepted surgical treatment, and in this case the extrasystoles disappeared after operation, just as frequently happens in this type of arrhythmia, when the source of toxemia is removed or diminished.

Although sinus arrhythmia is not usually considered to have any clinical importance, it was found to be lessened after operation, along with the signs of clinical improvement. Attention might here be called to the work of Thorne,[5] who considers that, like the other arrhythmias, though in a lesser degree, sinus arrhythmia is never found in a truly normal heart. Whether this belief is accepted or not, any procedure that tends to lessen an existing sinus arrhythmia should be considered a step in the direction of improving the cardiac condition.

EXPLANATION OF FIG. 4.

FIG. 4.—Case 26. Electrocardiogram of A. K., showing auricular flutter, with a varying degree of *A. V.* block, probably of four years' duration. In this as in the other electrocardiograms of this series records were taken from the three customary leads; the tension of the string was so standardized that 1 millivolt caused a deflection of 1 cm. Time intervals in this record are expressed by heavy and light vertical lines across each lead, representing $\frac{1}{5}$ and $\frac{1}{25}$ second respectively (Cambridge galvanometer). Each deflection is lettered according to Einthoven's scheme, and a diagram is added for each lead to illustrate the changing heart block. Note the prominent inverted (diphasic) *P* waves in Leads II and III.

Two cases (Cases 4 and 8) showing distinct prolongation of the *P–R* interval in the absence of digitalis medication are the only

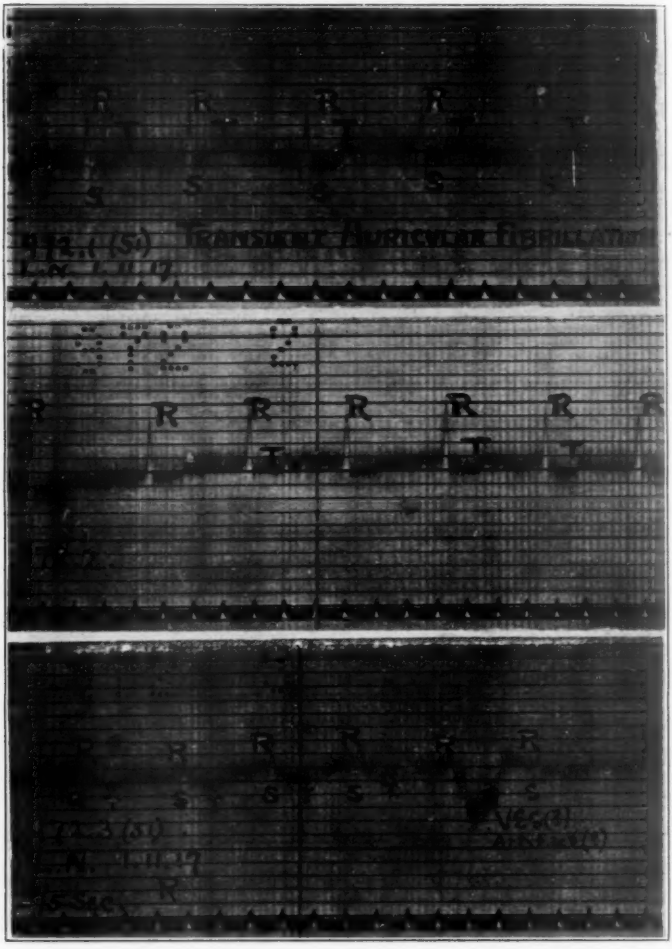

FIG. 5.—Case 51. Electrocardiograms of L. N., showing transient auricular fibrillation. Note that although the ventricular arrhythmia is slight, the same disturbance of mechanism exists as in Fig. 6.

examples of defective conductivity in this series. Reilingh,[6] however, has shown that more advanced degrees, even complete heart-block, may occur in exophthalmic goitre.

Blood-pressure. The systolic and diastolic blood-pressure was estimated soon after admission to the hospital, and in many cases shortly before discharge. The most noticeable abnormality was

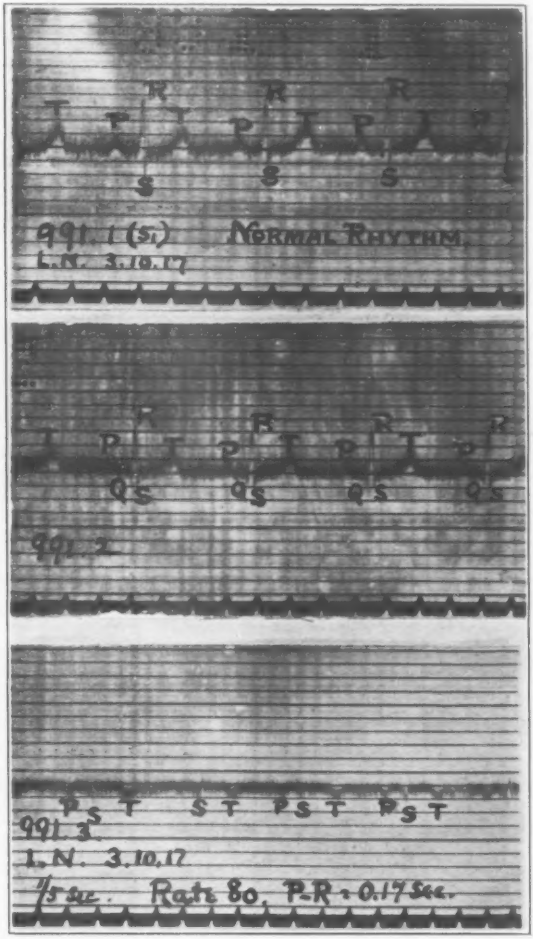

FIG. 6.—Electrocardiogram taken two months later, showing normal rhythm. Note (1) reappearance of *P;* (2) regular ventricular rhythm; (3) absence of irregular waves of fibrillation.

the increased pulse-pressure, which was over 60 mm. Hg. in 11 patients who showed no signs of hypertension. The increase in pressure, which was due both to elevation of the systolic and

depression of the diastolic pressure, is in all probability to be explained as the vascular response to the overacting heart. In 5

FIG. 7.—Case 50. Electrocardiogram of R. F., showing left ventricular preponderance and one ventricular premature contraction. Note that R_1 is greater than R_2 and that S_3 is greater than R_3. In Lead II note that the last ventricular complex varies greatly from the other complexes of the lead and occurs prematurely (extrasystole).

cases the systolic pressure was above normal limits, but in only 1 were signs of hypertensive nephritis or arteriosclerosis present. In at least 1 case the pressure fell to normal as the patient improved,

so that this, too, should be considered a sign of cardiac intoxication. The 3 cases that showed a lowered systolic pressure (below 110) are difficult to explain, but it should be noted in all of these that a

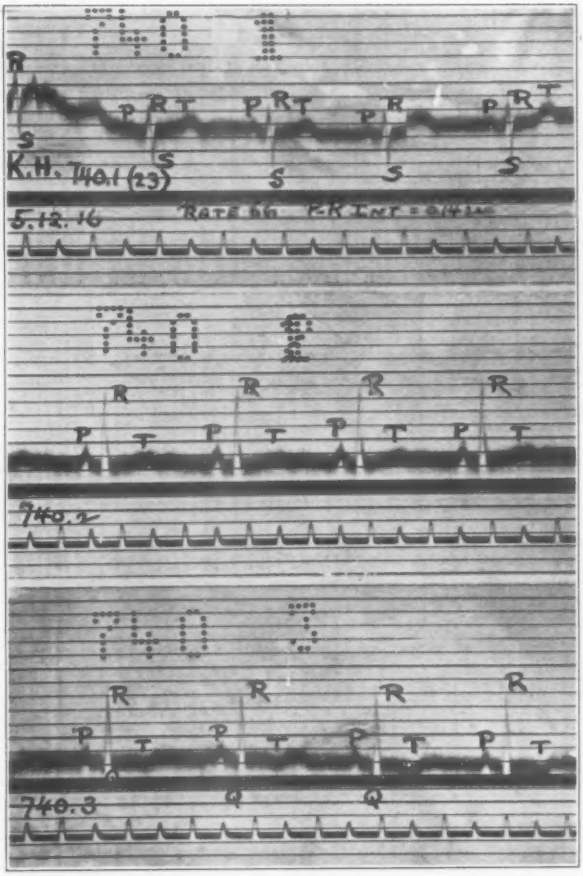

FIG. 8.—Case 23. Electrocardiograms of K. H., showing lessened degree of right ventricular preponderance after operation. Note that whereas S_1 is greater than R_1 in the first record, it is distinctly less in the second. Also R_3, instead of being the same size as R_2, is less than R_2 in the second record.

normal pulse-pressure was preserved. Although due to a different kind of disturbance these changes, as has been pointed out by Taussig,[7] are of the same kind as those found in aortic regurgitation, and may be considered as characteristic of toxic goitre.

Changes in Form of the Ventricular Complex. From the point of view of the cardiographer, one of the items of this study that was approached with the liveliest anticipation was the question as to what effect the thyreotoxicosis and also its treatment by surgical operation would have upon the cardiac function as expressed by

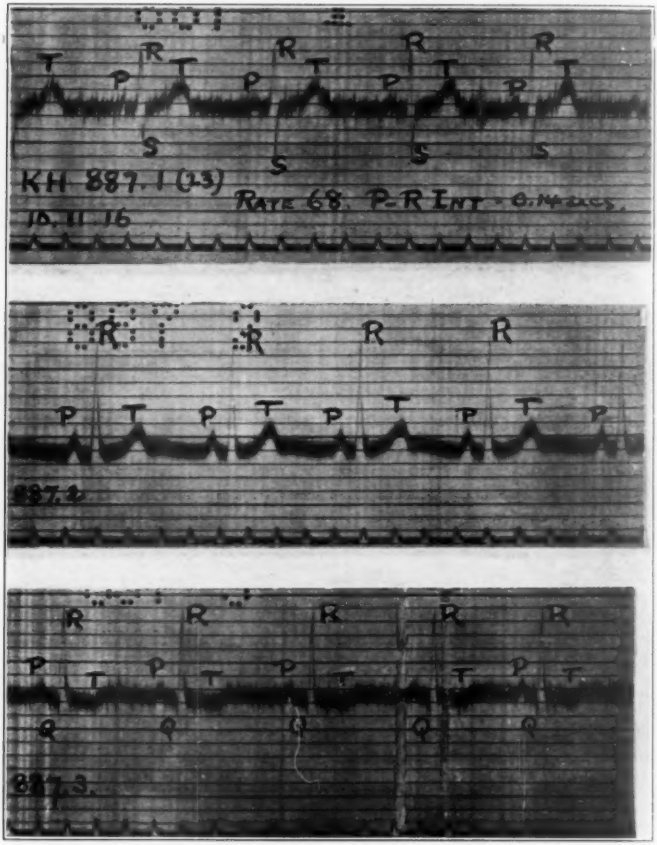

FIG. 9.—Same case as Fig. 8.

the form of the ventricular complex. As an analyzer of cardiac arrhythmias the string galvanometer has already been thoroughly and satisfactorily exploited. As a gauge of the functional capacity of the heart, however, in demonstrating abnormalities in form of the ventricular complex, its possibilities are still far from being realized. Lewis[8] has called attention to the fact that "if in any

subject electrocardiograms which show considerable divergence from what is regarded as normal are obtained it is probable that the heart is abnormal." This has corresponded to our experience

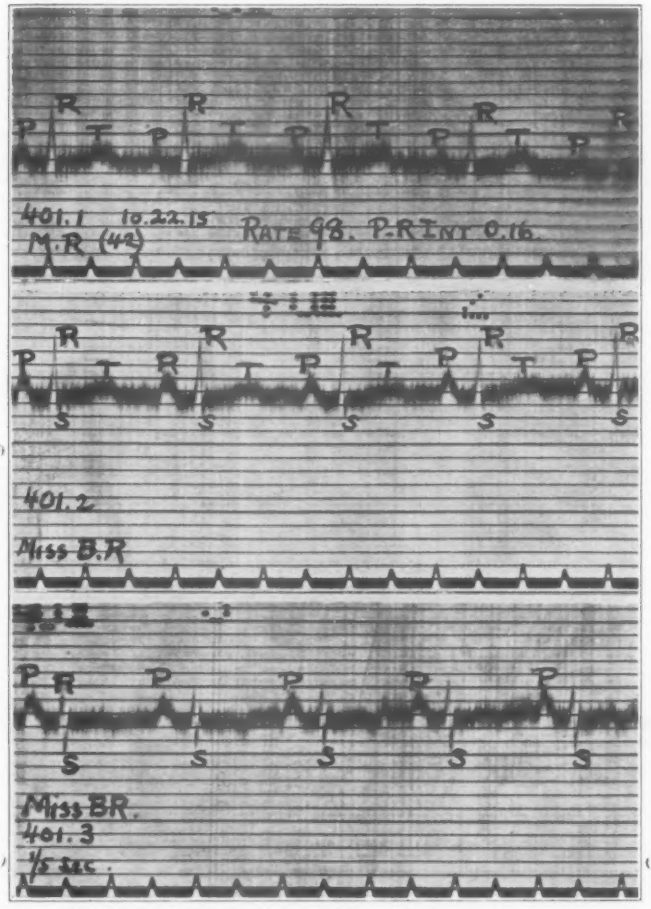

FIG. 10.—Case 42. Electrocardiograms of M. R. before and after operation, showing lessened T wave after operation and a more marked degree of left ventricular preponderance. In the second record note that the T waves are less than in the first (especially in Lead I); also that R_1 has become slightly longer than R_2 and that S_3 is proportionately longer than R_3. (See Fig. 11.)

in this clinic, although we cannot subscribe to "the converse proposition that if the summits fall within the normal limits of amplitude the heart is probably normal." We have seen in 2 cases

of this series, as well as in several other cardiac cases examined electrocardiographically, that the electrocardiogram was well within normal limits shortly before death from cardiac failure, and that even the form of the complex might be nearer normal shortly before

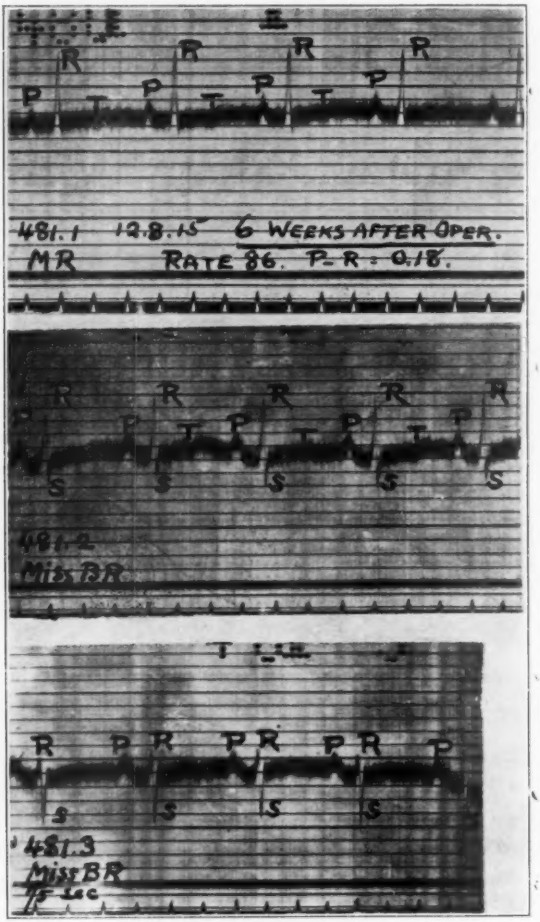

FIG. 11.—Same case as Fig. 10.

or during acute cardiac failure than it had been when the patient was clinically in better condition.

Preoperative variations from the normal form of the ventricular

complex not only include such changes as those showing hypertrophy of one or other ventricle but also notchings and

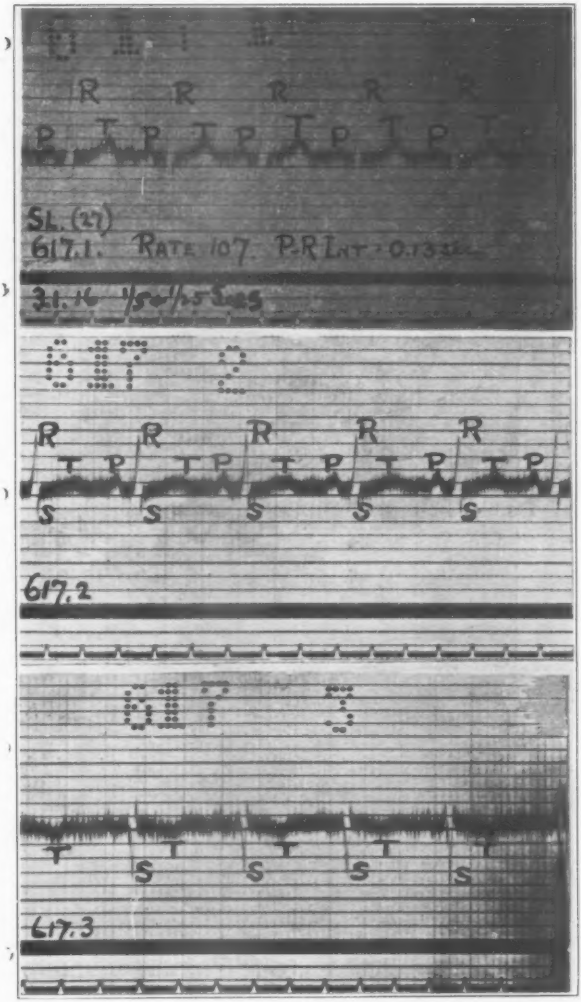

FIG. 12.—Case 27. Electrocardiograms of S. L., showing lessened *T* wave after operation. Time intervals in this record are expressed in $\frac{1}{5}$ and $\frac{1}{25}$ second, by vertical lines, as well as the Jaquet time marker. (See Fig. 13.)

undue prominence of single waves of the *Q*, *R*, *S* group (the clinical significance of which changes is as yet unknown) and also

various changes in form of the *T* wave. Essentially normal electrocardiograms in both form and rhythm were found in 22 of the 51 cases of the series.

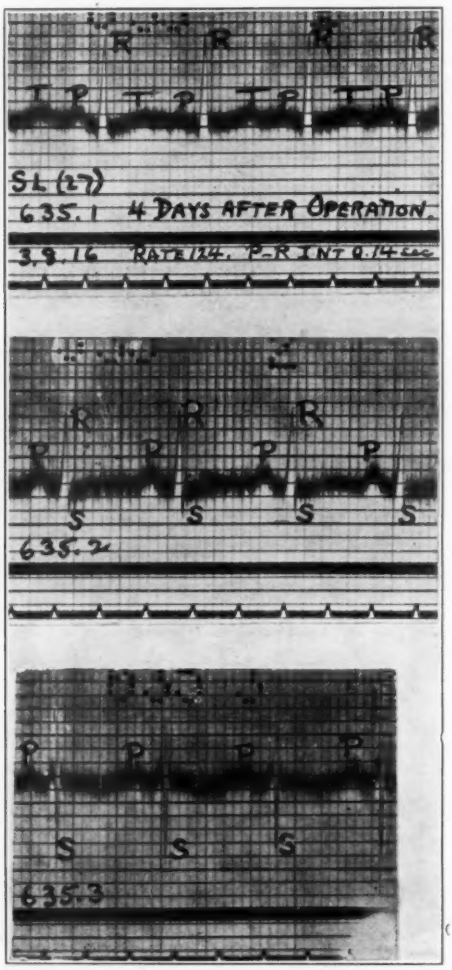

FIG. 13.—Same case as Fig. 12.

Hypertrophy of Auricles and Ventricles. Although the electrocardiogram registers action currents whose intensity depends on the strength of stimulus production, certain characteristic changes in the form of the ventricular complex have been recognized as indicat-

ing a preponderating hypertrophy of one or other ventricle. The evidence as to hypertrophy that is obtained in this way is more accurate and reliable than either the results of percussion or orthodiagraphic examination. The deduction as to the size of the muscle mass is nearly always true, because the stimulus going to

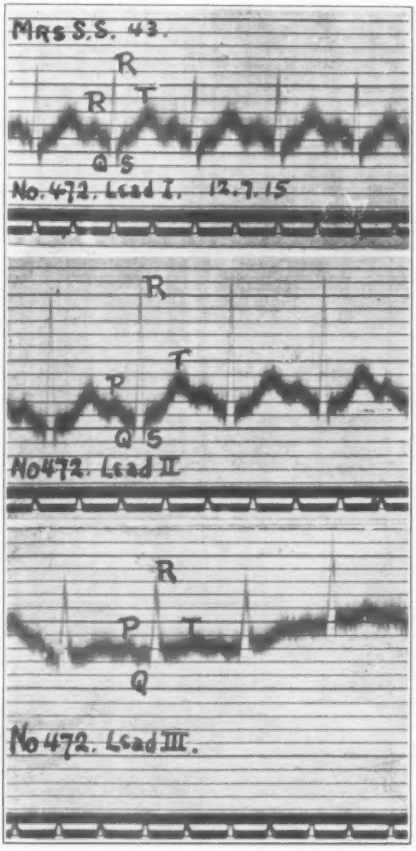

FIG. 14.—Case 43. Electrocardiograms of S. S., showing lessened *T* wave after operation that persisted for at least six months after operation.

the hypertrophied muscle mass is nearly always correspondingly increased. Some of the cases of this series, however, and also experimental work still in progress, indicate that the form of the ventricular complex (*i. e.*, the intensity of the stimulus production) may be noticeably changed without the occurrence of equivalent

change in muscle mass. Alterations occur within a few days after operation, when it would have been impossible for the muscle mass to have changed materially. The change in form that follows change in the axis of the heart has been shown to be relatively slight and clinically negligible, and is therefore not considered in this series.

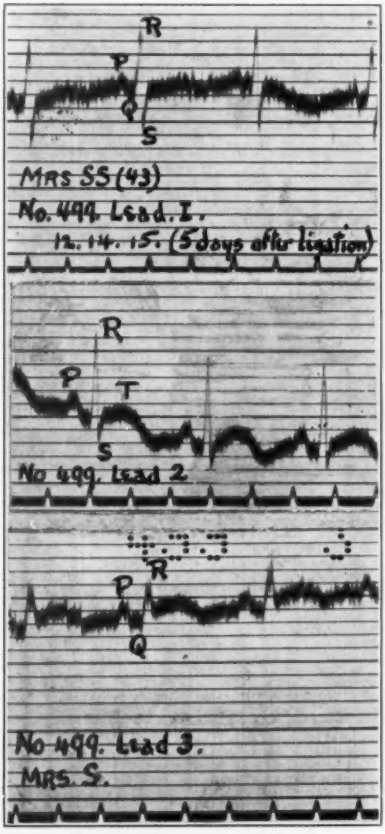

FIG. 15.—Same case as Fig. 14.

The state of right ventricular preponderance (R. V. H.) has been considered as present when both the S wave of Lead I (S_1) is greater than the R wave of Lead I (R_1) and when R_3 is greater than R_2 and when Q_2 and Q_3 are unusually large. When one of these factors is present or when the waves in question approach equality the condition is spoken of as a "tendency to R. V. H." Similarly

when R_1 is greater than R_2 and S_3 greater than R_3 and Q_1 prominent the state of left ventricular preponderance is recognized, and when this condition is approximated it is spoken of as a "tendency to left ventricular preponderance."

In the present series the majority of cases betrayed no signs of ventricular hypertrophy in the electrocardiogram. This is in accord with the experiences of other writers. Contrary to the general

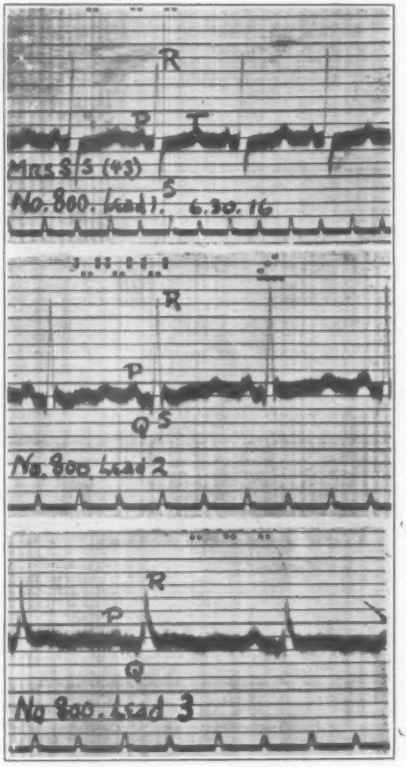

FIG. 16.—Same case as Fig. 14.

opinion, however, when hypertrophy was present, right ventricular preponderance has proved to be as common as left. It was distinct in 3 cases and a tendency to it existed in 8 cases. Left ventricular preponderance occurred in 6 cases and a tendency to it in 5 cases. It is difficult to explain why some cases of uncomplicated toxic goitre should develop right and others left ventricular preponderance. The most probable explanation would be that the left pre-

ponderance is due to whatever causes are responsible for the increased systolic pressure; whereas in the right preponderance cases other factors, such as relatively or actually incompetent mitral valve, would be considered as playing a more important

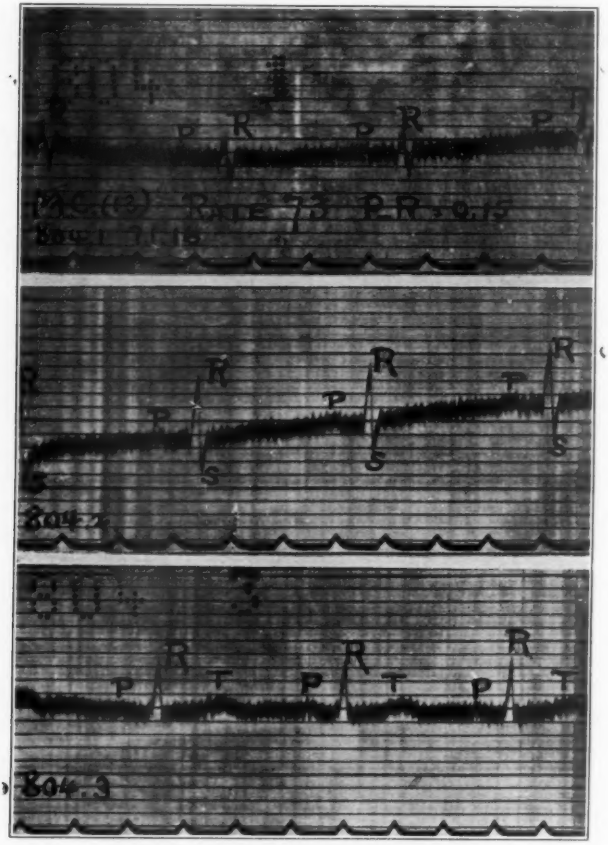

FIG. 17.—Case 13. Electrocardiograms of M. C., showing development of a negative *T* wave after operation. That this may be considered as a bad prognostic indication is supported by the death of this patient from cardiac failure after a second operation.

part. Some significance may be attached to the fact that the average duration of the disease in the right ventricular cases was under two and a half years, whereas in the left ventricular cases it was over four and a half years.

After surgical operation 5 of the right ventricle cases showed

less preponderance, 3 showed no appreciable change, and 2 an increased amount. Of the L. V. H. cases after operation, on the other hand, 4 showed no change, 6 showed an increased amount,

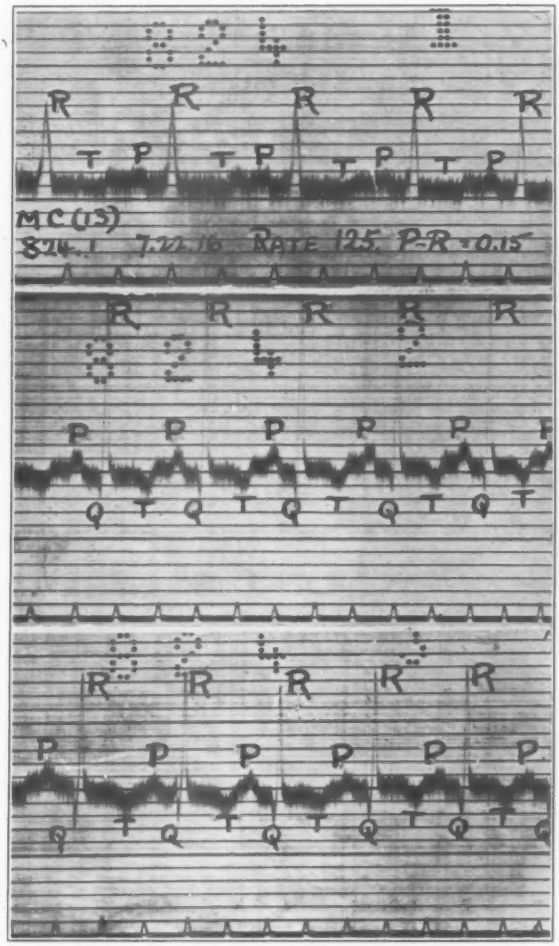

FIG. 18.—Same case as Fig. 17.

and only 1 showed a lessened degree of preponderance. This probably indicates that the left ventricular cases are due to a muscular hypertrophy that has already been accomplished and cannot be relieved by treatment even though signs of improvement are present.

The same reasoning may be applied to those right ventricular cases that do not change or progress. For those that showed lessened

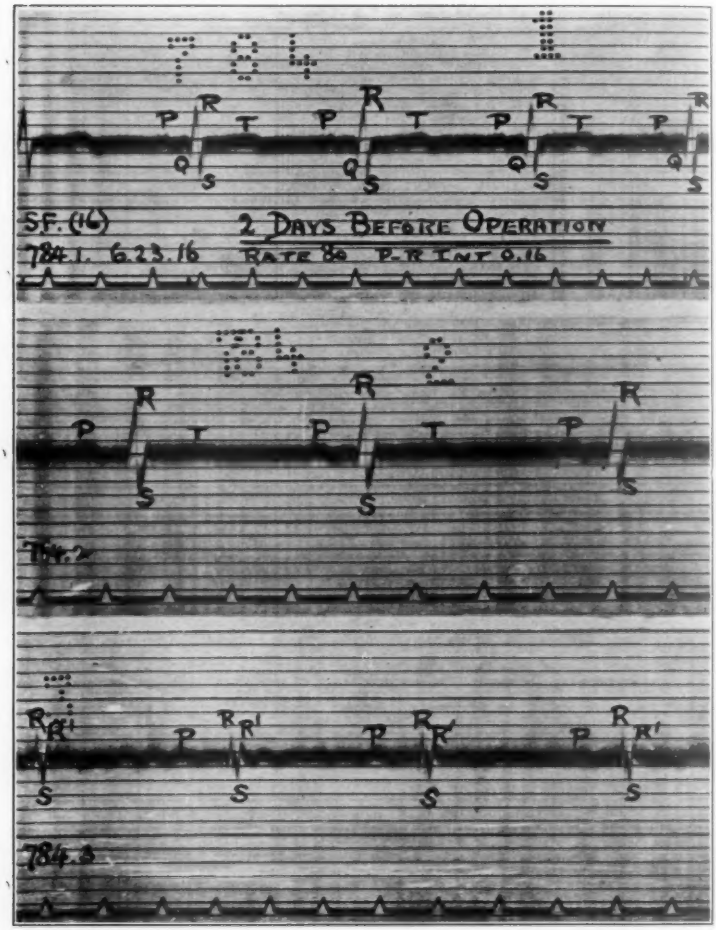

FIG. 19.—Case 16. Electrocardiograms of S. F., taken two days before, three days after, and twelve days after surgical operation, showing approximation of R_3 to normal in the last records. Note that the deep notch of R_3 in the first records becomes less and less noticeable in the second and third records. In this case the small postoperative T wave had already become larger by the twelfth day.

hypertrophy after operation a lessened impulse due to diminution of the intoxication might be assumed or possibly a nearer approach to competency of the mitral valve.

Changes in T Wave. In most of the cases of this series the T wave was well developed. This was especially noted in the more toxic cases and was even true in the 5 cases in which T_2 was either diphasic or inverted and in both cases in which T_1 was diphasic or

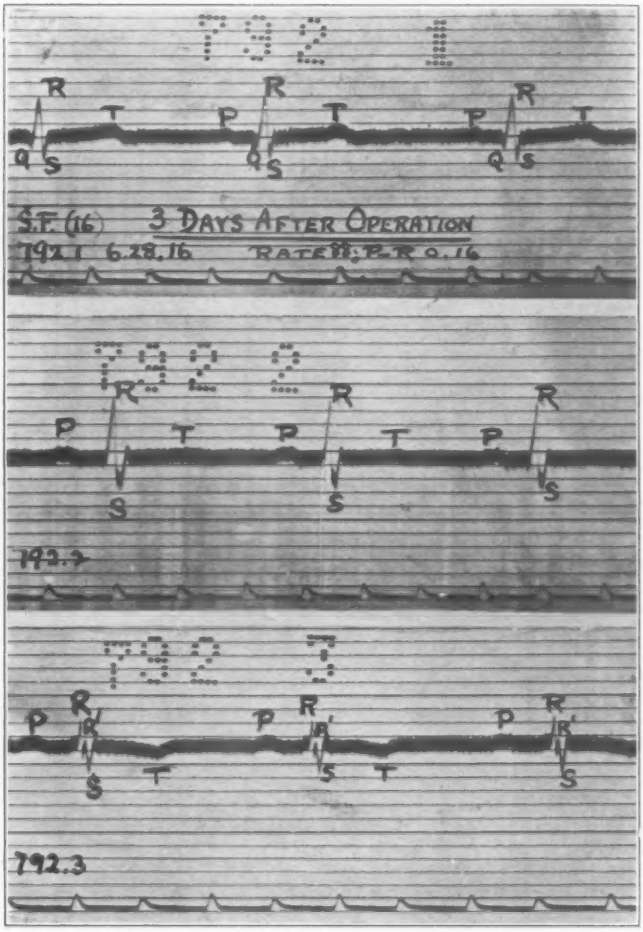

FIG. 20.—Same case as Fig. 19.

inverted. If in the absence of digitalis medication the T wave may be considered, as many authorities believe, as an index of the force of the cardiac contraction, such a result would be expected from the overacting goitre heart.

It is significant that out of the 23 cases that were examined within ten days of operation 11 showed a distinctly lessened *T* wave in all leads, coincident with general clinical improvement. One case also that improved greatly without operation exhibited

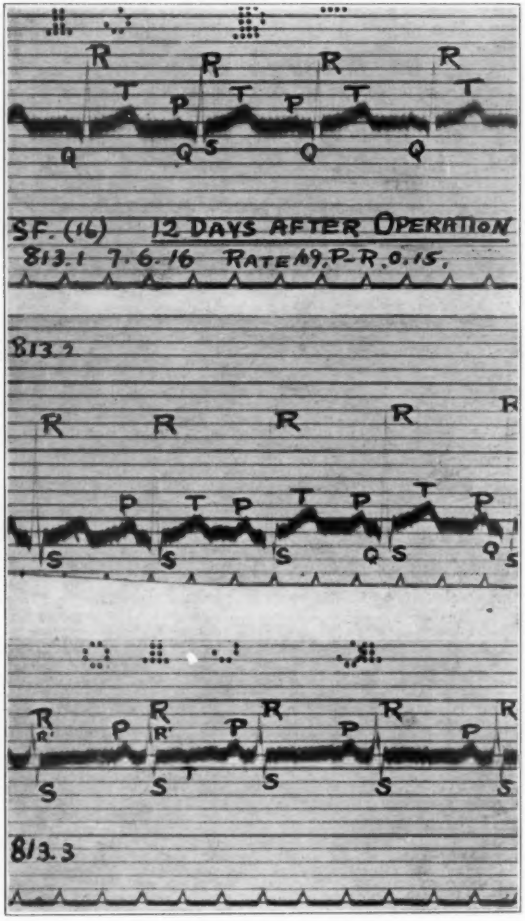

FIG. 21.—Same case as Fig. 19.

a diminished *T* wave in all leads during the improved period. The welcome deduction that could be drawn from these facts, to wit, that the smaller postoperative *T* wave indicated a quieting down of the overactive heart, was unfortunately complicated by

another observation, namely, that three control studies of three normal hearts showed the same tendency to a postoperative diminution of the *T* wave. This is a detail that in itself needs further

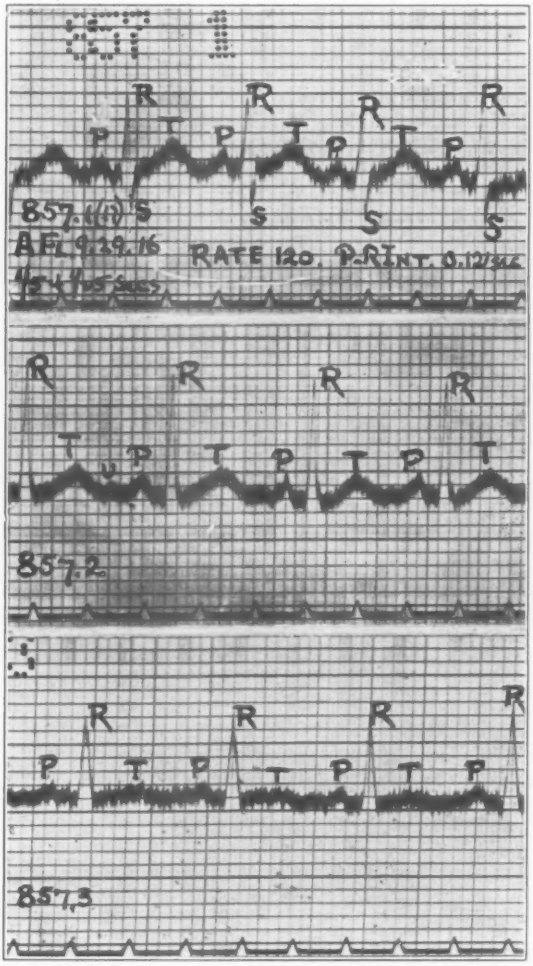

FIG. 22

investigation; at present, however, we are limited to the statement that such diminution is less in the normal than in the goitre cases and only lasts a few days. The diminution of the *T* wave of the

goitre heart is so much more accentuated and durable, often lasting three or more months, that it may be taken as highly probable that the heart's overaction has really been lessened and the treat-

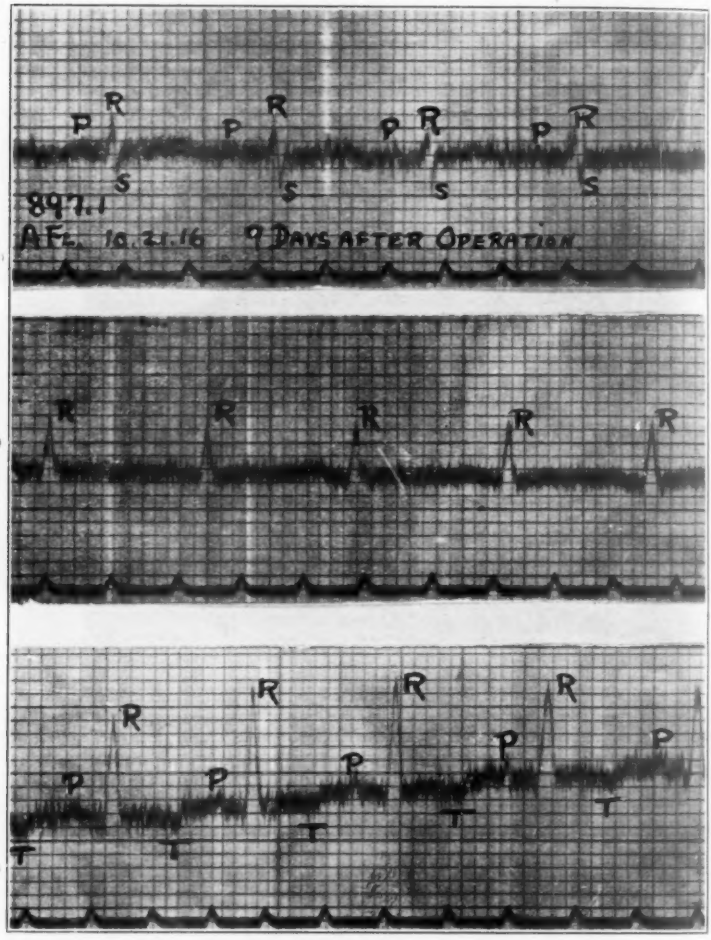

FIG. 23

ment been proved beneficial in so far as the electrical changes may be taken as a guide.

The persistent postoperative inversion of the *T* waves in one case (Case 13), with a subsequent fatal outcome to a second opera-

tion, has already been commented upon. In another case (Case 6) a failure to improve after operation was accompanied by the development of a negative *T* wave. In 2 other cases (Cases 28 and 51)

FIG. 24

general improvement during observation was accompanied by a change from negative to positive *T* waves. To this extent support is given to the idea that inverted *T* waves are of bad prognostic significance.

Other Changes in Form of the Ventricular Complex. In the form of the preoperative electrocardiograms various small changes from the established normal have been observed such as would be found in any similar series of cardiac cases. I refer to such details as unusually deep *S* waves in one or more leads, notching of the *R* wave and so forth. These were frequently changed after operation, or appeared after operation when they had previously been absent. As the significances of such changes, however, is not yet understood, and as they were often contradictory, no deductions can be drawn from them. Thus in Case 1 the *S* wave of an otherwise normal record was decreased in all leads after operation, whereas in Case 2 the *S* waves were all increased after operation. Case 16 (Fig. 11) presents an item of interest. In the preoperative electrocardiogram the *Q*, *R*, *S* group of Lead III was a bizarre collection of three upward and two downward peaks. Three days after operation, while the patient's general condition was improving, Lead III showed these peaks in such modified form that they could be explained as a deep notching of an *R*, *S* group. Nine days later, coincident with further improvement, Lead III had almost approached a normal complex, the notch being higher on the *R* wave and barely visible. While such anomalies are common in Lead III, and while their underlying cause is unknown, nevertheless it is reasonable to assume that the nearer approach of the electrocardiogram to a normal form is indication of an improvement in the cardiac mechanism.

SUMMARY. 1. Electrocardiographic studies have been made of 51 cases of goitre, mostly of the toxic type, in as many cases as possible both before and after surgical operation.

2. In the series of 47 patients that submitted to surgical operation (ligation, partial excision, and enucleation of adenomata) 3 deaths occurred; 2 of these offered no premonitory signs in either clinical or electrocardiographic examination; in the third case the development of negative *T* waves might have served as an adequate warning.

3. Electrocardiograms, essentially normal as to form and rhythm, were found in 22 cases (43 per cent.). Preponderating hypertrophy of the right ventricle (or a tendency thereto) was found in 11 cases, and of the left ventricle (or a tendency thereto) also in 11 cases. After operation, however, one-half of the right ventricular cases showed a diminished degree of preponderance, whereas all but one of the left ventricular cases showed either no change or an increased amount of preponderance.

4. Cardiac arrhythmia was found as follows: sinus arrhythmia, 4 cases; ventricular extrasystoles, 3 cases; auricular fibrillation, 3 cases; auricular flutter, 1 case; delayed conductivity, 2 cases. Two of the cases of fibrillation and the case of flutter proved constant over several years. The other case of fibrillation was of the

transient kind and disappeared coincident with the improvement that followed medical treatment.

5. The *T* wave was found to be unusually prominent in most cases. In about half the cases it was markedly and persistently diminished after operation. This was found to be true to a lesser degree in postoperative cases with normal hearts. Other changes in form of the ventricular complex after operation indicated an approximation to normal cardiac mechanism.

6. Blood-pressure estimation showed an increased pulse-pressure in most cases that was diminished with the improvement that followed surgical relief. Systolic pressure was also high in those cases that showed left ventricular preponderance, but never exceeded 170 mm. Hg.

CONCLUSIONS. 1. In early cases of toxic goitre the characteristic tachycardia is not accompanied by any signs of myocardial change that are demonstrable with the string galvanometer.

2. With persisting overaction of the heart, hypertrophy of either ventricle may become manifest.

3. Progressive hypertrophy and overaction results in myocardial degeneration that may be manifested by any type of cardiac irregularity: sinus arrhythmia, premature contractions, auricular flutter, auricular fibrillation, heart-block, etc.

4. If the existing intoxication is the chief factor in the production of the arrhythmia this may disappear with removal of the intoxication.

5. Successful treatment, whether medical or surgical, improves the cardiac condition by this means. This is shown not only by the occasional disappearance of an arrhythmia but also by diminution in the size of the *T* wave and in the pulse-pressure as well as by the general clinical condition.

6. The development of diphasic or inverted *T* waves, especially in Leads I and II, should probably be considered as influencing prognosis unfavorably.

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ROENTGENOLOGICAL STUDIES IN THE HEALING OF GASTRIC AND DUODENAL ULCERS.[1]

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It is a common experience that the interpretation of cure of chronic gastric ulcer is difficult because of the spontaneous remissions and exacerbations of symptoms so frequent in the clinical history of these patients. The need of more definite and objective evidence of cure has been apparent for some time. In the attempt to secure such evidence we have been interested during the past two years in studying these patients by means of repeated roentgenological examinations before, during, and following medical treatment. Our method is as follows:

1. In addition to the regular routine of history-taking, physical examination, test-meal examination, etc., the patient is subjected to a thorough preliminary roentgenological study, including the registering of from six to twelve plates, taken at intervals after the barium meal.

2. In the event that positive roentgenographic evidence of ulcer is thus obtained, the patient is put under medical treatment (the details of which do not concern us here) for from three to six weeks. Within this time and before discharge from the hospital the patient is again thoroughly studied roentgenologically, including the making of plates.

3. The patient is asked to report back to the hospital at least every three months for a repetition of the roentgenographic studies.

In other words, roentgenological examinations are made before, during, and after medical treatment, as often as every three months, for a period of one to two years or longer. These studies serve as a guide to the healing process, and as a contrast with the findings before treatment was begun.

Thus far we have studied in this fashion 11 cases, of which 7 are lesser curvature cases and 4 are duodenal.

In this paper I shall refer very briefly to the results of this study.

I. Lesser Curvature Ulcer. Haudek,[2] in 1910, described his classical *Nischen Symptom*, which was the demonstration roentgenologically of a small round projection (Ründliche Vorsprung) along the lesser curvature of the stomach. Haudek believed that this projection or pocket represented the accumulation of

[1] Read at the Twentieth Annual Meeting of the American Gastro-Enterological Association, Atlantic City, 1917.

[2] Die Roentgendiagnose des Kallösen Magengeschwüres und ihre Bedeutung, Münch. med. Wchnschr., 1910, S. 2463.

bismuth or barium in the crater of a penetrating ulcer. In certain cases the pocket or crater of bismuth was surmounted by a small air bubble which could be observed in the plate.

Haudek's observations and conclusions have been confirmed by many workers both in this country and abroad. During the course of our work we have had abundant opportunity to examine such stomachs either at the operating table or at autopsy, and have likewise been assured of the correctness of Haudek's work.

Cole,[3] in 1915, amplified Haudek's work, reporting a series of indurated gastric ulcers of the lesser curvature—with or without the niche—detected at a far earlier stage. Cole's method, which he describes, is that of serial roentgenography. Many of our plates, particularly those taken after medical treatment, strikingly resemble those of Cole's indurated ulcers.

Faulhaber,[4] in 1912, emphasized the importance of the spastic hour-glass stomach, either in conjunction with the Haudek niche or alone, as evidence of callous ulcer. While undoubtedly such hour-glass contraction occurs, in our experience they have been quite uncommon, while the lesser curvature projection has been quite frequent. In one case with a very pronounced hour-glass and a lesser curvature niche the operation failed to reveal an ulcer. This case will be referred to later in the discussion of the dangers of misinterpretation in this method of examination.

The positive identification of the niche to be in fact the ulcer crater may be seen in Figs. 1, 2 and 3 from Cases I, II and III.

The abstract of the history of the patient from whom Fig. 1 was taken is as follows:

CASE I.—L. S., blacksmith, aged fifty-seven years, Michael Reese Hospital.

Complaint. Pain in upper abdomen, loss of weight, recurring attacks every three or four months for the past two years. Pain sticking in character, one to two hours after meals. Two months ago had three attacks of hematemesis.

Physical Examination. Slight loss of weight, tender point in mid-epigastrium, otherwise negative.

Test-meal Examination. Continuous secretion, yeast cells, sarcinæ, normal acidity.

Roentgenographic Findings. "Lesser curvature contains a defect about two inches from the pylorus resembling that of a perforated ulcer." (Fig. 1.) Marked gastric retention after six hours.

Operation. Dr. L. A. Greensfelder: "On the posterior wall at the lesser curvature an easily palpable callous ulcer is found, approxi-

[3] Roentgen Diagnosis of Indurated Gastric Ulcer, Am. Jour. Roentgenology, November, 1915.

[4] Roentgendiagnostic der Magenkrankheiten, von Dr. M. Faulhaber, Sammlung Zwangloser Abhandlungen aus dem Gebiete der Verdaungs und Stoffwechsel Krankheiten, 1912, Band iv, Heft 1.

mately 4 cm. from the pyloric sphincter (Fig. 1). The thickened callous area was about 5 cm. in diameter and practically round. Pylorectomy, including resection of the ulcer, was performed."

In passing it is interesting to note that the location of the ulcer and its size corresponds very closely with the findings as obtained roentgenologically.

FIG. 1.—Case I. L. S. Lesser curvature ulcer. Roentgenogram and ulcer after excision.

The history of the patient from whom Fig. 2 was taken is as follows:

CASE II.—P. O., patient of the County Hospital, with a typical recurring history of gastric ulcer for eight years.

Roentgenological Examination. "Marked penetrating ulcer, lesser curvature half-way between the cardia and the pylorus." (Fig. 2.)

Operation. Dr. Paul Oliver: "Deep callous ulcer found on the lesser curvature in median portion of stomach. Ulcer resected. Gastro-enterostomy performed." (Fig. 2.)

Here also the close similarity between the roentgen-ray findings and the ulcer may be noted.

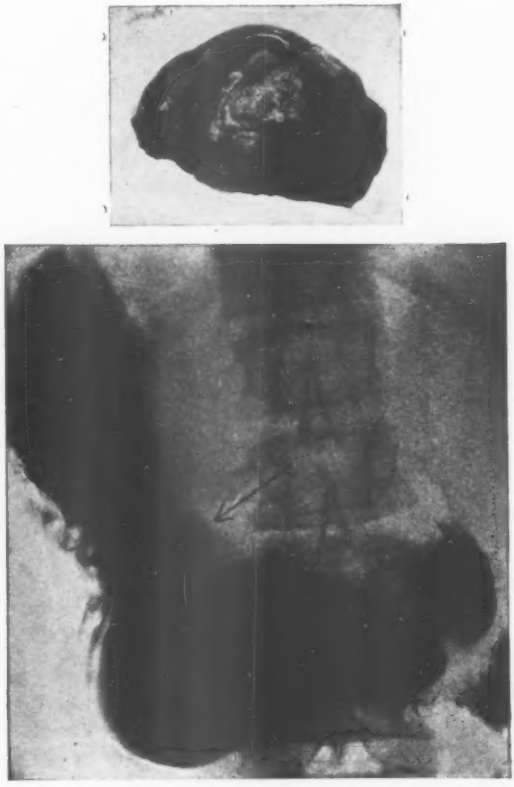

FIG. 2.—Case II. P. O. Lesser curvature ulcer. Roentgenogram, "niche," and ulcer after excision.

Fig. 3 is taken from the following case:

CASE III.—J. R., car repairer, aged fifty-four years. Cook County Hospital.

Present Complaint. Began fourteen months ago, consisting of epigastric pain one and a half hours after eating, with nausea and vomiting.

Roentgen Ray. "A rather large, penetrating ulcer is seen on the lesser curvature of the stomach." (Fig. 3.)

Operation. Dr. Paul Oliver: "Indurated ulcer on lesser curvature about 5 cm. in diameter; some scar on serous surface with firm fibrous adhesions to the left lobe of the liver. Adhesions separated. Ulcer inverted by Lembert linen stitch. Posterior gastric jejunostomy."

FIG. 3.—Case III. J. R. Penetrating ulcer of lesser curvature adherent to under surface of liver.

While the ulcer itself was not resected, and therefore could not be studied histologically, still the location and the findings agreed so exactly with the roentgen-ray picture that there can be no doubt regarding the identification of the projection with the adherent callous ulcer.

These three representative cases I believe are convincing proof of Haudek's contention that the niche does in fact represent the crater of a callous ulcer. That these ulcers were in fact callous gastric ulcers and not carcinoma was proved by serial microscopic section, in none of which was any evidence of malignancy noted.

The permanent cure of the first two patients following operative removal of their ulcer, the first for nine months and the second for three years, is substantiating clinical proof of the non-malignant character of their disease.

Accepting, then, as definitely established, that the barium projection represents the ulcer crater, let us turn to a consideration of the changes in morphology of the niche during and after medical treatment. In certain cases the depth and width of the projection gradually lessens until, in the favorable cases, it has entirely disappeared, leaving a smooth, regular, lesser curvature outline. This disappearance of the niche can be followed accurately from week to week and month to month, and is usually accompanied with coincident improvement in the clinical findings, viz., disappearance of epigastric pain and distress; cessation of vomiting; disappearance of occult blood in stool and stomach contents; gain in weight, appetite, hemoglobin, and general well-being ot the patient; gradual return to normal of gastric secretion and motility. Such ulcers may be said to be *healing*, and in the event that these objective and subjective changes continue satisfactorily, may, at the end of six to twenty-four months, be said to be *cured*, depending on the personal conservatism of the observer.

Certain other cases, however, do not progress so satisfactorily, either because of insufficient dietary care on the part of the patient, inaccuracy in the details or duration of medical management, or because of other underlying organic disease, such as carcinoma, syphilis, and tuberculosis. In these ulcers the niche narrows only temporarily, later resuming its former contour or even becoming deeper, wider, and more irregular. Such patients demand either more accurate medical management, specific tuberculous or luetic treatment, or *surgery*—or all three.

The following 3 cases have been chosen as representative of the changes in the niche before, during, and after medical treatment.

CASE IV.—L. B.[5] male, aged fifty-four years.

Complaint. Patient has suffered from "indigestion" for twelve to fifteen years, consisting of periodical exacerbations of severe colicky pain. At different times diagnosis of chronic gall-bladder and appendix have been made.

Radiographic examination revealed a broad, deep, penetrating ulcer of the lesser curvature, midway between the cardia and the pylorus (Fig. 4).

After two weeks of medical treatment a second roentgen ray was made, showing marked diminution in the depth and width of the lesser curvature pocket (Fig. 5). This coincided with parallel clinical improvements.

[5] History and permission to report this case was kindly given by Dr. Jacobson. I am indebted to Dr. Rountree, of the Presbyterian Hospital, for prints and copies of the roentgen-ray pictures.

FIG. 4.—Case IV. L. B. Broad penetrating ulcer, lesser curvature. Before medical treatment.

FIG. 5.—Case IV. L. B. Lesser curvature ulcer after two weeks' medical treatment. Compare with Figs. 3, 5 and 6. Note increase in depth and width of "niche."

FIG. 6.—Case IV. L. B. After four weeks' medical treatment. Compare with Figs. 4, 5 and 6.

FIG. 7.—Case IV. L. B. After three months' treatment. Compare with Figs. 4, 5 and 6. Note complete disappearance of "niche," with resulting indurated area. Clinical improvement parallel.

Four weeks later a third roentgen ray was made, showing still more marked change in the lesser curvature (Fig. 6).

Three months after beginning of medical treatment a fourth roentgen ray was made, showing complete disappearance of the lesser curvature projection (Fig. 7).

While the niche itself has disappeared one could see, fluoroscopically, that the normal peristaltic waves along the lesser curvature ceased in the area of the ulcer similar to the observation of Cole,[6]

FIG. 8.—Case A. T. H. Penetrating ulcer of lesser curvature before treatment. Arrow indicates Haudek "niche" or pocket due to crater of ulcer filled with bismuth.

who calls this the "indurated area." In other words, apparently all that has happened is the filling up of the crater with organization tissue and possibly the transformation of a florid, penetrating ulcer into either an indurated callous ulcer or an indurated scar on the lesser curvature. The absence of the normal peristaltic waves is conclusive evidence that complete restitution with absorption of all connective tissue has not occurred.

[6] Loc. cit.

CASE V.—A. T. H.[7] a tea-taster by occupation.

Complaint. Late pains, vomiting, loss of weight, periodically, for five years.

Test Meals. Subacidity; hypersecretion; motility normal.

Roentgen Ray. Penetrating ulcer of the lesser curvature (Fig. 8).

Three months after treatment, during which time clinical progress was satisfactory, roentgen ray reveals slight convexity at site of original ulcer (Fig. 9).

FIG. 9.—Case A. T. H. Healing of lesser curvature ulcer three months after institution of medical treatment. Arrow points to slight convexity at site of original ulcer. Compare with Figs. 8 and 10.

Four months after treatment third roentgen ray practically normal. Lesser curvature contour sharp and clean (Fig. 10).

This patient has now remained free from all gastric distress for nearly two years since treatment was begun.

CASE VI.—R. K., aged fifty-two years, a dye-worker. (Service of Dr. J. C. Friedman.)

[7] This case, as well as cases VI, VIII and IX, have been reported in greater detail in the Medical Clinics of Chicago, 1916, ii, 419.

Present Complaint. Epigastric pain for five years, vomiting, hematemesis.

Roentgen Ray. Penetrating ulcer of the lesser curvature (Fig. 11).

Three months after treatment second roentgenological examination shows a lesser curvature defect still present, but a beginning narrowing and filling up of the ulcer crater (Fig. 12).

This patient has since disappeared from observation, but according to what scant information is at hand he is still having gastric symptoms.

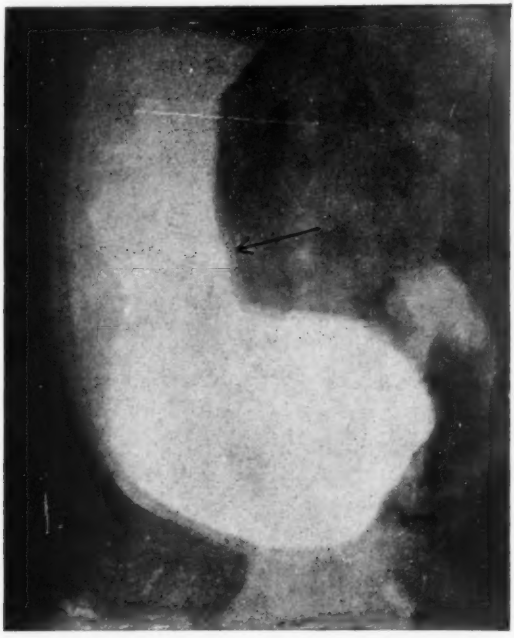

FIG. 10.—Case A. T. H. Healing of ulcer after four months' treatment. Arrow points to site of original ulcer. Compare with Figs. 8 and 9.

The results of these studies bring up some rather interesting questions which may be discussed as follows:

1. It is obvious that this method is of value in studying the changes occurring in callous ulcer during the healing process.

2. The complete disappearance of the projection, *together with* parallel improvement in the patient's clinical condition, is strong presumptive evidence of healing of the ulcer.

3. The complete disappearance of the pocket cannot be interpreted as complete normal restitution of the stomach wall, but

probably is to be interpreted as simply the filling up of the ulcer crater, with probably the formation of an indurated callous ulcer or of a thickened scar. The failure of normal peristaltic waves to continue through the ulcer area is positive evidence of a remaining pathological condition.

4. The method is in no sense to be construed as an argument for or against medical treatment, but is of distinct value in the selection of cases for medical or surgical treatment; for in those cases, such

FIG. 11.—Case VI. R. K. Before treatment. Compare with Fig. 12.

as R. K. (Case VI), in which the crater could not be made to entirely disappear after prolonged medical treatment, such cases are undoubtedly worthy of surgical intervention.

5. The method does not serve to rule out carcinoma. While in my own series I have yet to experience a lesser curvature ulcer which underwent malignant degeneration (or was cancer from the start and misdiagnosed), still the possibility of overlooking an early cancer must be granted, as emphasized by Cole, Case and others.

6. Even though the ulcer crater has completely disappeared, resulting in the production of an indurated scar, permanent cure may not have been obtained. For it is possible that this scar, as in scars elsewhere in the body, remains a *locus minoris resistentiæ* may undergo secondary breaking down with the formation of a fresh active ulcer.

FIG. 12.—Case VI. R. K. After three months' medical treatment. Compare with Fig. 11. Note narrowing and filling of ulcer crater.

7. Extreme care and countless reëxaminations in all positions, including the taking, if possible, of serial plates must be insisted upon to avoid the danger of overlooking the persistence of a small crater pocket. Even with such precautions the danger of overlooking such small projections must be granted.

8. Normal peristalsis may at times be mistaken for penetrating ulcer, as was forcibly impressed upon us by the following interesting experience (Case VII).

CASE VII.[8]—Married woman, aged twenty-six years, symptoms for three years, consisting of late pains, hematemesis, and bloody stools.

Roentgen Ray. Hour-glass contraction of the stomach and indurated ulcer of the lesser curvature (Fig. 13).

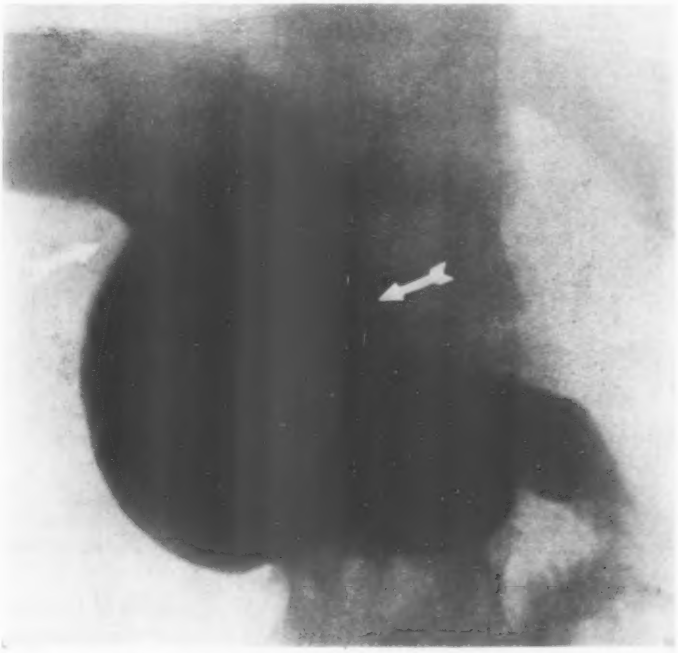

FIG. 13.—Case VII. A. S. Normal peristalsis resembling penetrating ulcer. Compare with Fig. 14.

Operation. (Dr. Kahlke.) "Following careful exploration of the entire stomach, anterior and posterior, cardia to pylorus, no evidence of ulcer could be found. Stomach was not opened. Appendix, gall-bladder, and ovaries, negative."

Cole has reported a similar case (Fig. 14). However, inasmuch as exploration of the stomach was not made *from within*, it is conceivable that a small penetrating ulcer was present, but was not diagnosed. That this is not an infrequent experience can be attested to by many surgeons and roentgenologists.

[8] I am indebted to Dr. Kahlke for the details of this case as well as permission to report same.

II. Duodenal Ulcer.—Cole,[9] in 1914, described his method of serial radiography for the diagnosis of duodenal ulcers based on the recognition of a "constant deformity of the cap or sphincter caused by the induration or cicatricial contraction surrounding the crater of an ulcer or resulting therefrom."

The method described above for the control of treatment of lesser curvature ulcer has been applied to the treatment of duodenal ulcer.

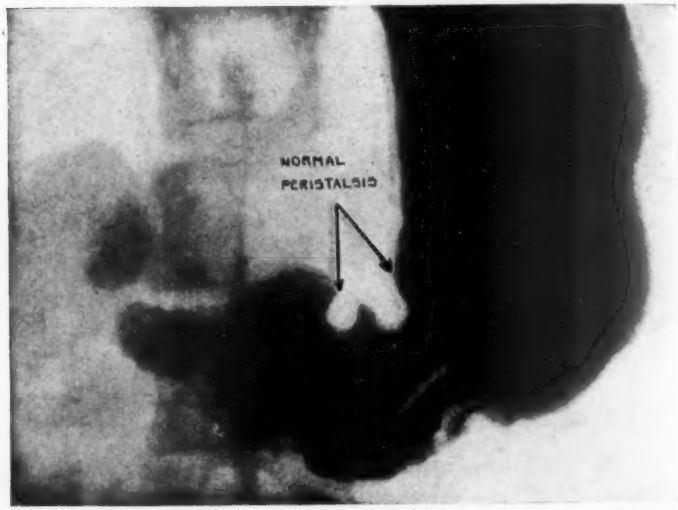

Fig. 14.—Normal peristalsis resembling ulcer. Compare with Fig. 13. (Taken from Cole.)

The following cases may be taken as representative of this type:

Case VIII.[10]—E. F. W., merchant, aged thirty-three years.

Complaint. Periodical for twelve years; distress after eating; black stools; vomiting of blood; loss of weight.

Test Meals. Hyperacidity; normal motility.

Roentgen Ray. Constant deformity of the duodenal bulb; motility less than six hours. Peristalsis active (Fig. 15).

Four and a half months after medical treatment with second roentgen-ray examination: The bulb was still defective, but with possible lessened degree of contraction. Peristalsis normal. No pylorospasm. Motility six hours (Fig. 16).

Case IX.[11]—I. E. S., attorney, aged thirty-one years.

Complaint. Periodically for eighteen years, fulness late after meals, belching, gnawing sensation at night.

Test Meals. Hyperacidity, hypersecretion, and delayed motility.

[9] The Diagnosis of Post-Pyloric (Duodenal) Ulcer, Lancet, May 2, 1914.
[10] Loc. cit.
[11] Loc. cit.

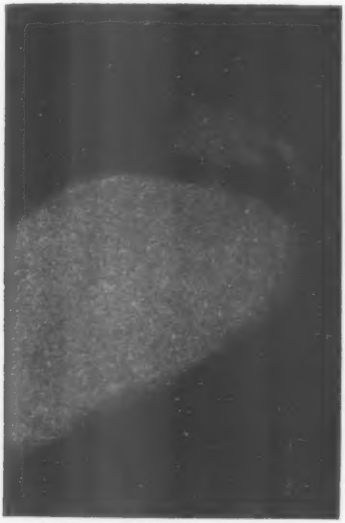

FIG. 15.—Defective duodenal cap due to chronic duodenal ulcer of twelve years standing (case E. F. W.) Before medical treatment.

FIG. 16.—Case E. F. W. Four and a half months after medical treatment. Bulbus still defective but not quite so contracted. Compare with Fig. 15.

Roentgen Ray. Peristalsis slow; considerable retention in six hours. Bulbus defective (Fig. 17).

FIG. 17.—Case I. E. S. Before medical treatment. Duodenal ulcer of eighteen years' standing.

FIG. 18. Case I. E. S. One month after medical treatment.

One month after medical treatment: Normal peristalsis, motility four hours, bulbus still defective (Fig. 18).

This method applied to cases of duodenal ulcer has not, up to the present, been productive of as many positive findings as in the case of lesser curvature ulcer. Notwithstanding it would appear that such repeated roentgenological examinations are of value and should be instituted as a routine in the medical treatment of all ulcers.

Conclusions. 1. A method of roentgenological study of the healing of gastric and duodenal ulcer is described. This method consists of repeated roentgenological studies of ulcer patients before, during, and at varying intervals after the institution of medical treatment.

2. This method is of value in the diagnosis, prognosis, control of medical treatment, and selection for surgical treatment of gastric and duodenal ulcer.

3. The method is of value in studying the pathology of the healing process in both clinical and experimental ulcer. Thus far it is not of positive value in the differential diagnosis between ulcer and cancer, although in the future it may shed some light on the much-discussed problem—the frequency of malignant degeneration of callous ulcer.

4. In the use of the method the danger of mistaking normal peristalsis for penetrating ulcer and of the overlooking of the presence of small ulcer because of incomplete or insufficient examination must be borne in mind.

5. These results are presented only as a preliminary report for the purpose of stimulating work by other men along similar lines. It is in no sense to be construed as the final word on the subject, for each new case, as it is studied, brings its own message and suggests new view-points and problems to be interpreted, thus amplifying and possibly negativing the conclusions reached in the preceding cases.[16]

CHEMICAL ANALYSES OF THE STOMACH CONTENTS FROM 100 PELLAGRINS.

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Introduction. In a recent communication by Hunter, Givens and Lewis[1] from the laboratory of the United States Pellagra Hospital at Spartanburg, S. C., the results of gastric analyses of 29

[16] Most of the roentgenological examinations were made for me by Mr. Arendt, in charge of the roentgen-ray department of the Michael Reese Hospital, to whom I herewith express sincere appreciation for his assistance.

[1] Bull. No. 102, Hyg. Lab., Washington, 1916, pp. 42–46.

cases of pellagra in various stages of the disease were reported and discussed. The present paper covers the outcome of work along the same line, presenting data from 100 more cases. For the first time observations on a few cases at short intervals over a long period of time are reported. The investigation is also of interest in that it includes the examination of gastric contents from 24 pellagrous children.

Concerning the gastric disturbance in pellagra there is a general opinion, based on the conclusions reached by numerous students of the disease, that the absence of free hydrochloric acid is to be expected. Marie[2] says: "The gastric juice is often less acid in pellagrins. The hydrochloric acid is diminished." Myers and Fine[3] state, "Anacidity is a condition common in pellagra found in 8 of our 14 cases." Though not evident from their statements, nevertheless the opinion is generally held that free hydrochloric acid is absent, as a rule, in pellagra. Such a condition may be expected, but it is not necessarily found.

The above expectation had its foundation on the statements contained in the report of Lombroso, Filippi and Roncoroni,[4] on the examination of 2 cases for acidity; 10 cases (incorrectly quoted by some as 12 cases) by Cecconi[5] for acidity; 10 cases by Nesbit[6] for acidity and rennin; 20 cases by Johnson[7] for acidity and rennin; 14 cases by Myers and Fine[8] for acidity and pepsin, and the statement of Niles[9] concerning "analyses of 64 cases of undoubted pellagra" for acidity. These reports are of great value, but, with the exception of that of Myers and Fine, none of them throw any light upon the secretion of pepsin in the pellagrin.

Unfortunately, Myers and Fine used Rose's[10] method for the determination of pepsin. We believe this method to be faulty in that it demands neutralization of the gastric juice before determining the pepsin. Using Rose's original method one might find a decreased amount or entire absence of pepsin, depending upon the amount of free acid present. On this account too much reliance must not be placed upon their peptic values.

METHODS. During the year 1915 at the Pellagra Hospital of the U. S. P. H. S. at Spartanburg, S. C., I have examined the gastric contents of 76 cases of pellagra, and in connection with the work of the U. S. P. H. S. at a certain orphanage (E. C.) the gastric contents of 24 pellagrous children. The acidity has been determined by Töpfer's (see Hawk,[11]) method and the pepsin by my

[2] Pellagra, translated by Lavinder and Babcock, Columbia, S. C., State Company, 1910, p. 163.
[3] AM. JOUR. MED. SC., 1913, cxlv, 705.
[4] Marie, Pellagra, 1910, p. 201.
[5] Gazzetta degli Ospedali e delle Cliniche, 1911, xxxii, 643.
[6] Tr. Nat. Conf. on Pellagra, Columbia, S. C., State Company, 1909, p. 222.
[7] South. Med. Jour., 1911–1912, iv, 478.
[8] Loc. cit.
[9] Pellagra: An American Problem, Philadelphia, 1912, p. 77.
[10] Arch. Int. Med., 1910, v, 459.
[11] Practical Physiological Chemistry, Philadelphia, 1914, p. 440.

modification[12] of Rose's method. The contents of the stomach have been removed in sixty minutes and in some instances, forty-five minutes after the usual Ewald-Boas (see Sahli-Potter[13]) test meal. In the latter cases the gastric contents have been examined on one day after an Ewald meal and on the following day after a water meal. For the water meal the technic of Rehfuss, Bergeim and Hawk[14] has been used. The Rehfuss tube is given the patient, then 200 c.c. of distilled water introduced, in some cases 150 c.c., and samples for analysis removed after fifteen, thirty, forty-five, and sixty minutes.

Sufficient evidence has been obtained to show that in pellagra the water meal is just as efficient a stimulant for gastric secretion as bread and water. The conclusion is not reached from these few typical examples but from the examination of 30 cases. Table I shows the results of an Ewald meal one day and a water meal the following day.

TABLE I.—COMPARISON OF EWALD WITH WATER MEAL IN PELLAGRA.

Case No.	Date.	Total acidity.	Free hydrochloric acid.	Pepsin.	Vol., c.c.	Sample withdrawn after mins.	Meal.
52	May 29, 1915	105	86	25	72	60	Ewald.
	June 1, 1915	27	19	13	17	15	
		36	26	13	19	30	
		48	35	20	19	45	Water.
		71	55	33	17	60	
126	Aug. 13, 1915	85	56	31	29	60	Ewald.
	14, 1915	40	29	20	15	15	
		56	41	25	14	30	Water.
		76	59	33	17	45	
		87	66	33	22	60	
1	June 2, 1915	84	62	25	62	60	Ewald.
	3, 1915	33	23	13	14	15	
		41	27	17	17	30	Water.
		72	51	20	19	45	
		94	76	25	18	60	
9	June 1, 1915	60	34	20	..	60	Ewald.
	2, 1915	26	13	13	..	15	
		37	24	20	..	30	Water.
		60	35	33	..	45	
		42	23	33	..	60	
129	Aug. 19, 1915	19	0	0	43	60	Ewald.
	20, 1915	16	0	0	21	15	
		17	0	0	17	30	Water.
		20	0	0	10	45	
		21	0	0	42	60	
105	Aug. 12, 1915	17	0	Trace	36	60	Ewald.
		7	0	"	15	15	
		9	0	"	16	30	Water.
		9	0	"	16	45	
		11	0	"	24	60	

[12] Givens, Maurice H.: Bull. No. 101, Hyg. Lab., Washington, 1915, p. 71.
[13] Diagnostic Methods, Philadelphia, 1914, p. 448.
[14] Jour. Am. Med. Assn., 1914, lxiii, 909.

Besides the fact shown that water has produced a secretion of acid and pepsin, when it is capable of being produced in pellagra, we believe there is an explanation for it, based upon Carlson's work.[15] Carlson has shown that there is a continuous secretion poured out by the gastric glands in normal persons varying from 2 to 50 c.c. per hour. He states that "the autodigestion of the gastric juice itself is a probable factor in this continuous secretion." We know that when water is introduced into the stomach there is very little absorption, but that it soon passes into the intestines. Is it not then very probable that the products of autodigestion of the gastric juice are absorbed from the intestines and produce the flow of gastric juice in the case of the water meal?

Shortly after admission each patient was given either the Ewald or water meal and the stomach contents removed for examination. In some cases examinations were made at intervals of a week or longer, and this procedure continued for several months.

The results of analyses performed at the Pellagra Hospital are included in Table II, in which the cases are arranged on a basis of decreasing free hydrochloric acid; those at the orphanage, in Table III, are arranged according to duration of disease.

It would be superfluous to give in detail the clinical histories of the cases at either institution. Suffice it to say that there is as great a range and diversity of symptoms as those given in our first paper dealing with this subject. Some were severe, acute cases; some mild, acute cases; some mild, chronic and some moderately mild, chronic. Notwithstanding the large number of cases examined, and the fact that examinations were made before, during, after, and between acute attacks a careful study of the clinical conditions does not seem to permit us to correlate the absence or reduction of free hydrochloric acid and pepsin with any clinical phase of the disease. The absence of acid and pepsin does not seem to be dependent upon the number of attacks or recurrences or the duration of pellagra. This is brought out in Tables II and III, in which the number of years the patient has been subject to the disease is recorded. In Table II the word of the patient, as recorded in the case histories, is accepted. Fortunately in Table III we have the result of an examination by the same competent physician covering the periods noted.

The Ewald meal given consisted of 30 grams bread and 200 c.c. water. Of the 106 times this meal was given there were 19 instances in which more than 70 c.c. were recovered and 28 in which less than 20 c.c. were received. The remainder were within the limit of 20 to 70.

[15] Am. Jour. Physiol., 1915, xxxviii, 248.

TABLE II.—ANALYSES OF GASTRIC CONTENTS FROM ADULT PELLAGRINS.

Case No.	Sex.	Age, yrs.	Date.	Vol., c.c.	Total acidity.	Free hydrochloric acid.	Pepsin.	Meal.	Time, mins.	Duration of pellagra.
66	M.	30	Mar. 26, 1915	22	120	92	31	Ewald	60	1911–1915.
			April 6, 1915	17	79	61	26	Ewald	60	
			20, 1915	22	116	88	41	Ewald	60	
52	M.	34	Mar. 3, 1915	65	101	84	42	Ewald	60	1912–1915.
			9, 1915	100	84	64	31	Ewald	60	
			24, 1915	74	90	65	25	Ewald	60	
			April 6, 1915	40	89	60	21	Ewald	60	
			20, 1915	49	90	59	25	Ewald	60	
			May 29, 1915	72	105	86	25	Ewald	60	
			June 1, 1915	17	71	55	33	Water	60	
			Nov. 11, 1915	33	54	37	33	Water	60	Out, attack, returned.
			Feb. 15, 1916	9	67	46	33	Water	60	
126	M.	38	Aug. 13, 1915	29	85	56	33	Ewald	60	1915.
			14, 1915	22	87	66	33	Water	60	
116	M.	22	16, 1915	4	74	76	20	Ewald	60	1915.
			17, 1915	16	93	69	33	Water	60	
171	F.	22	Feb. 25, 1916	163	74	52	25	Water	60	1915–1916.
1	F.	36	Sept. 3, 1914	123	74	52	31	Ewald	45	1914.
			Dec. 15, 1914	65	76	50	31	Ewald	45	
			Dec. 15, 1915	60	69	53	33	Ewald	45	
			Feb. 13, 1915	80	78	64	33	Ewald	45	
			15, 1915	112	76	57	41	Ewald	60	
			Mar. 24, 1915	98	73	49	31	Ewald	60	
			26, 1915	44	95	70	31	Ewald	60	
			April 7, 1915	46	80	52	21	Ewald	60	
			20, 1915	22	74	49	25	Ewald	60	
			June 2, 1915	62	84	62	25	Ewald	60	
			3, 1915	18	94	76	25	Water	60	
103	M.	29	Aug. 12, 1915	137	91	60	25	Ewald	60	1915.
			13, 1915	12	80	52	25	Water	60	
9	F.	24	Sept. 3, 1914	32	72	47	31	Ewald	45	1914.
			14, 1914	7	54	35	31	Ewald	45	
			Jan. 15, 1915	34	51	32	33	Ewald	45	
			Feb. 10, 1915	40	62	39	33	Ewald	45	
			26, 1915	25	57	38	40	Ewald	60	
			June 1, 1915	41	60	34	20	Ewald	60	
			2, 1915	13	42	23	33	Water	60	
			Aug. 9, 1915	38	62	37	33	Ewald	60	
			21, 1915	14	27	14	31	Water	30	
85	F.	22	May 17, 1915	19	66	49	41	Water	60	1914–1915.
70	M.	49	April 7, 1915	23	60	40	8	Ewald	60	1915.
			21, 1915	26	71	50	16	Water	60	
			May 13, 1915	52	64	46	25	Water	60	
			Aug. 20, 1915	114	78	51	16	Ewald	60	
			21, 1915	32	61	42	25	Water	60	
88	M.	39	May 27, 1915	58	62	36	25	Ewald	60	1914–15.
			Aug. 17, 1915	32	65	32	25	Ewald	60	
95	M.	44	June 12, 1915	14	52	31	33	Water	60	1915.
150	F.	24	Nov. 8, 1915	122	47	31	21	Water	60	1914–1915.
167	F.	46	Feb. 16, 1916	40	52	34	33	Water	60	1913–1915.
160	M.	15	21, 1916	12	65	40	25	Water	60	1912–1915
77	M.	51	April 21, 1915	15	91	68	21	Ewald	60	Do not know.
			23, 1915	10	96	74	16	Ewald	60	
			May 27, 1915	4	59	28	13	Water	15	
			28, 1915	2	53	31	13	Water	15	
51	F.	30	Feb. 12, 1915	27	62	52	20	Ewald	45	1914.
			Mar. 9, 1915	17	62	41	10	Ewald	60	
			24, 1915	12	37	12	10	Ewald	60	
			April 6, 1915	17	40	18	8	Ewald	60	
			21, 1915	8	46	25	10	Ewald	60	
			June 1, 1915	6	10	0	0	Ewald	60	
59	F.	27	Mar. 3, 1915	47	52	35	25	Ewald	60	1914.
			9, 1915	40	45	25	25	Ewald	60	
			26, 1915	9	27	7	20	Ewald	60	
			April 8, 1915	29	18	0	Tr.	Ewald	60	
			22, 1915	15	14	0	4	Ewald	60	
			June 2, 1915	49	23	2	Tr.	Ewald	60	
			3, 1915	11	6	0	0	Water	60	
154	M.	44	Nov. 8, 1915	28	68	50	13	Water	60	1915.
60	F.	22	Mar. 6, 1915	43	48	23	16	Ewald	60	1915.
			11, 1915	47	56	31	21	Ewald	60	1915.
			24, 1915	39	61	34	21	Ewald	60	
			April 7, 1915	15	62	40	16	Ewald	60	

TABLE II—*continued.*

Case No.	Sex.	Age, yrs.	Date.	Vol., c.c.	Total acidity.	Free hydrochloric acid.	Pepsin.	Meal.	Time, mins.	Duration of pellagra.
89	F.	57	May 28, 1915	29	60	32	13	Ewald	60	1915.
83	M.	68	28, 1915	4	30	9	11	Ewald	60	1914–1915.
			June 1, 1915	2	58	35	11	Water	60	
			11, 1915	3.5	86	59	20	Water	30	
109	M.	7	Aug. 23, 1915	21	57	39	10	Water	45	1914–1915.
115	M.	28	16, 1915	100	56	32	10	Ewald	60	1915.
145	F.	23	Oct. 6, 1915	84	51	37	17	Water	60	1913–1915.
179	F.	30	Feb. 21, 1916	5	47	30	20	Water	45	1914–1915.
151	F.	28	Nov. 4, 1915	26	46	19	25	Water	60	1915.
142	M.	40	9, 1915	122	41	16	25	Water	60	1915.
86	F.	26	May 21, 1915	14	15	7	17	Water	45	1915.
			June 3, 1915	124	44	18	13	Ewald	60	
147	M.	12	Nov. 9, 1915	10	41	16	10	Ewald	50	1915–1916.
143	F.	36	Oct. 6, 1915	25	40	22	20	Water	60	1914–1915.
128	F.	24	Nov. 4, 1915	47	34	19	13	Water	60	1915.
137	F.	33	Oct. 6, 1915	23	35	9	10	Water	45	1915.
118	F.	44	Aug. 14, 1915	103	31	19	17	Water	60	1912–1915.
61	F.	20	April 6, 1915	29	30	6	10	Ewald	60	1915.
99	M.	5	Aug. 23, 1915	137	30	20	10	Water	60	1914–1915.
80	F.	26	May 20, 1915	173	26	18	17	Water	60	5 or 6 years.
148	F.	38	Nov. 6, 1915	3	25	8	10	Water	30	1915.
63	M.	21	Mar. 23, 1915	64	24	5	16	Ewald	60	1913–1915.
161	M.	13	Feb. 15, 1916	10	32	7	10	Water	45	1915.
87	F.	28	Aug. 16, 1915	22	14	0	0	Water	60	
			17, 1915	3	40	Tr.	17	Ewald	60	1912–1915.
122	F.	46	11, 1915	25	37	0	Tr.	Ewald	60	
			12, 1915	5	20	0	Tr.	Water	60	
121	F.	21	11, 1915	89	26	0	Tr.	Ewald	60	1915.
			12, 1915	84	27	0	Tr.	Water	60	
112	F.	19	11, 1915	14	35	0	16	Ewald	60	1914–1915.
			12, 1915	82	19	0	Tr.	Water	60	
133	F.	36	Oct. 7, 1915	27	24	0	10	Water	60	1914–1915.
135	M.	17	2, 1915	150	21	0	10	Water	60	1915.
152	F.	32	Nov. 6, 1915	21	15	0	Tr.	Water	45	1915.
48	F.	33	Mar. 11, 1915	22	14	0	Tr.	Ewald	60	1912–1915.
			April 8, 1915	5	30	0	Tr.	Ewald	60	
			21, 1915	3	23	0	8	Ewald	60	
			June 2, 1915	5	13	0	0	Water	45	
93	F.	33	12, 1915	35	15	0	10	Water	60	1915.
105	F.	23	Feb. 12, 1915	36	17	0	Tr.	Ewald	60	1913–1915.
			13, 1915	24	11	0	Tr.	Water	60	
14	M.	58	Sept. 3, 1914	65	11	0	0	Ewald	45	1914–1915.
			8, 1914	77	12	0	0	Ewald	45	
			Oct. 17, 1914	110	9	0	Tr.	Ewald	45	
			Nov. 24, 1914	50	14	0	Tr.	Ewald	45	
			Dec. 30, 1914	112	18	0	0	Ewald	45	
			Feb. 11, 1915	70	13	0	0	Ewald	45	
			Mar. 11, 1915	56	35	7	13	Ewald	60	
			15, 1915	33	34	4	Tr.	Ewald	60	
			April 8, 1915	32	40	7	8	Ewald	60	
			May 25, 1915	14	20	0	0	Water	45	
			26, 1915	27	32	7	10	Ewald	60	
2	M.	22	Sept. 2, 1914	86	21	0	Tr.	Ewald	45	1913–1915.
			8, 1914	134	24	0	10	Ewald	45	
			Oct. 17, 1914	144	24	0	Tr.	Ewald	45	
			Nov. 24, 1914	153	14	0	Tr.	Ewald	45	
			Dec. 22, 1914	53	17	0	Tr.	Ewald	45	
			30, 1914	100	18	0	Tr.	Ewald	45	
			Feb. 12, 1915	52	25	12	25	Ewald	45	
			Mar. 6, 1915	60	20	0	Tr.	Ewald	60	
			11, 1915	36	21	0	Tr.	Ewald	60	
			25, 1915	6	24	0	10	Ewald	60	
36	M.	55	Oct. 15, 1914	1	..	0	..	Ewald	45	1914.
			Feb. 11, 1915	10	7	0	0	Ewald	45	
			Mar. 25, 1915	27	32	5	Tr.	Ewald	60	
			April 8, 1915	28	50	18	8	Ewald	60	
			May 26, 1915	45	21	0	Tr.	Water	45	
			27, 1915	27	25	3	10	Ewald	60	
			Aug. 18, 1915	19	26	0	10	Ewald	60	
129	M.	36	19, 1915	43	19	0	0	Ewald	60	Past 5 or 6 yrs.
			20, 1915	42	21	0	0	Water	60	
73	M.	36	April 13, 1915	53	27	0	0	Ewald	60	1915.
			June 1, 1915	28	10	0	0	Water	60	
			Aug 18, 1915	16	13	0	0	Ewald	60	
			19, 1915	3	20	0	0	Water	45	
			Nov. 11, 1915	9	15	0	0	Water	30	

TABLE II—*continued.*

Case No.	Sex.	Age, yrs.	Date.	Vol., c.c.	Total acidity.	Free hydrochloric acid.	Pepsin.	Meal.	Time, mins.	Duration of pellagra.
82	M.	50	May 28, 1915	9	14	0	0	Water	60	1914–1915.
			29, 1915	7	14	0	0	Water	30	
81	M.	48	26, 1915	5	20	0	0	Water	45	1914–1915.
			27, 1915	25	10	0	0	Ewald	60	
			Aug. 18, 1915	6	14	0	0	Ewald	60	
94	M.	16	June 11, 1915	186	21	0	0	Water	60	1914–1915.
50	M.	6	Feb. 11, 1915	38	21	0	0	Ewald	60	1915.
79	F.	19	May 19, 1915	116	18	0	0	Water	60	1915.
			June 3, 1915	58	18	0	0	Ewald	60	
100	M.	15	Aug. 16, 1915	25	18	0	0	Ewald	60	1915–1916.
			18, 1915	218	10	0	0	Water	60	
69	F.	34	April 8, 1915	19	25	0	0	Ewald	60	1914–1915.
57	M.	47	Mar. 24, 1915	2	10	0	0	Ewald	60	1914–1915.
			April 6, 1915	4	19	0	0	Ewald	60	
			May 26, 1915	15	28	0	0	Ewald	60	
			28, 1915	3	28	0	0	Water	30	
58	F.	40	Mar. 6, 1915	28	18	0	Tr.	Ewald	60	1915.
55	F.	28	3, 1915	65	20	0	0	Ewald	60	1909–1915.
84	M.	23	May 11, 1915	30	21	0	0	Ewald	60	1910–1915.
149	F.	42	Nov. 11, 1915	18	14	0	0	Water	45	1912–1915.
144	F.	27	4, 1915	21	11	0	0	Water	45	1912–1915.
155	F.	30	8, 1915	78	9	0	0	Water	60	1915.
132	M.	57	Oct. 4, 1915	14	15	0	0	Water	60	1911–1915.
140	M.	40	2, 1915	18	21	0	0	Water	60	1915.
141	M.	59	2, 1915	22	22	0	0	Water	60	1913–1915.
131	M.	52	Aug. 24, 1915	6	10	0	0	Water	45	1913–1915.
176	F.	35	Feb. 16, 1916	48	16	0	0	Water	60	1915.
164	M.	32	15, 1916	22	12	0	0	Water	45	1915.
153	F.	31	21, 1916	15	16	0	0	Water	45	1911–1915.

From the work of Boldyreff[16] one would expect some more or less constant relationship between the acidity and the volume of

TABLE III.—ANALYSES OF GASTRIC CONTENTS FROM PELLAGROUS CHILDREN.

Case No.	Sex.	Age, years.	Vol., c.c.	Total acid.	Free hydrochloric acid.	Pepsin.	Meal.	Sample withdrawn after mins.	Duration of pellagra.
200	M.	12	20	93	73	25	Water	40	1 year.
205	M.	8	29	51	34	25	Water	60	1 year.
202	M.	13	7	44	19	10	Water	60	1 year.
207	M.	13	8	42	21	20	Water	60	1 year.
201	M.	10	31	40	22	10	Water	60	1 year.
204	M.	6	5	40	20	10	Water	60	1 year.
203	F.	6	13	35	24	10	Water	20	1 year.
206	F.	15	17	38	20	20	Water	60	1 year.
214	M.	12	13	50	30	33	Water	60	2 years.
216	M.	14	5	42	29	17	Water	60	2 years.
209	M.	8	5	34	21	10	Water	60	2 years.
211	M.	8	10	29	11	10	Water	60	2 years.
213	M.	6	112	26	9	10	Water	60	2 years.
215	M.	13	63	25	12	13	Water	60	2 years.
210	M.	10	98	20	0	Tr.	Water	60	2 years.
212	M.	7	23	19	8	10	Water	20	2 years.
208	M.	11	72	12	0	0	Water	60	2 years.
217	M.	10	97	58	43	20	Water	60	3 years.
218	F.	16	51	51	33	20	Water	60	3 years.
219	M.	17	6	87	62	33	Water	60	4 years.
221	M.	15	46	61	43	17	Water	60	4 years.
220	M.	9	32	46	24	10	Water	60	4 years.
222	M.	13	70	12	0	0	Water	60	4 years.
223	M.	10	9	59	35	17	Water	40	5 years.

[16] Quart. Jour. Exper. Physiol., 1914, viii, 1.

fluid in the stomach. He has shown conclusively that gastric contents of a high degree of acidity are not permitted to enter the intestines until the acidity has been reduced to about 0.14 per cent. hydrochloric acid. He states "The more rapidly the acidity diminishes the more quickly the stomach empties itself." Accordingly one would expect in the case of a high acidity to find a rather large volume of fluid in the stomach and the reverse with a low acidity. No doubt a good part of the water was in the stomach, because of the high acidity due to the secretion of hydrochloric acid. In the case of no secretion of hydrochloric acid, from our ideas concerning the stay of water in the stomach, we would expect the stomach shortly to empty itself. In the cases here reported there is no constant or definite relationship between volume and acidity; that is to say, with a high acidity there are many instances at the end of an hour with a small volume in the stomach, some with a large volume; cases with low acidity of large and small volume; cases with no acidity of large and small volume.

ACIDITY. Before making the divisions later referred to it will be necessary to set some limits. The following table shows the normal standard after the Ewald meal as accepted by the authors whose names are opposite:

	Vol., c.c.	Total acidity.	Free acidity.
Butler[17]	20 to 50	40 to 60	27 to 55
Sahli-Potter[18]	30 to 70	..	40 to 55
Emerson[19]	30 to 70	40 to 60	20 to 60
Farr and Goodman[20]	..	40 to 60	
Goodman[21]	..	40 to 60	

We concur in the opinion expressed by Bergeim, Rehfuss and Hawk[22] that these values are too low. They do not offer another standard, but state that their total acidity values ranged from 50 to 120, with an average of 77 after their water meal. They have found higher values than the clinicians quoted above in perfectly normal individuals after an Ewald meal. Reviewing their work, and taking it in conjunction with some of our own,[23] it is here proposed to offer as limits of the standard for a normal total acidity 50 to 80. We mean to consider the acidity as subnormal if below the figure 50 and the free hydrochloric acid deficient if below 18. When above 80 we prefer to consider the acidity as of their "hypersecretory type," since no other findings or the clinical

[17] Diagnostics of Internal Medicine, New York, 1913, p. 670.
[18] Loc. cit.
[19] Clinical Diagnosis, Philadelphia, 1913, p. 353.
[20] Arch. Int. Med., 1908, i, 648.
[21] AM. JOUR MED. SC., 1908, cxxxvi, 734.
[22] Jour. Biol. Chem., 1915, xix, 345.
[23] Givens, M. H.: Bull. No. 101, Hyg. Lab., Washington, 1915, p. 71.

evidence warrant calling these cases of hypersecretion. A review of Tables II and III gives:

10 cases of the hypersecretory type or	10 per cent.
22 cases of the normal type or	22 "
29 cases of the subnormal type or	29 "
39 cases with absence of HCl	39 "

Pellagra favors neither age nor sex in bringing about the condition found in the stomach; that is to say, free acid and pepsin may be absent in the young or old, male or female. If one desired to make a more discriminating separation a survey of Tables II and III would permit of the selection of the following types of gastric secretion as found in the pellagrin:

High free acidity with normal pepsin.
Normal free acidity with normal pepsin.
Disappearing free acidity with disappearing pepsin.
Normal free acidity with low pepsin.
Low free acidity with normal pepsin.
Low free acidity with low pepsin
No free acidity with trace of pepsin.
No free acidity with no pepsin.

Previous to the present investigation enough cases have not been studied by any one person to allow such a grouping. This shows the great number of possible conditions one would be liable to find in a given case.

As will be seen from the number of types of secretion the free hydrochloric acid and pepsin did not run hand in hand. In the majority of cases in which free acid was absent pepsin also was absent. Accepting 25 to be the low limit for pepsin, we find it normal in 20 cases, subnormal in 32, deficient (10— to trace) in 21, and absent in 23.

A record of the presence of bile in the contents has been kept, but it is not considered worth adding, and thereby further complicating the two tables for two reasons: In the first place it is practically impossible to introduce the tube without causing the patient to gag more or less. In order to overcome this tendency as much as possible, coöperation (on the part of the patient) was sought, but, owing to the class here treated, little was rendered. On this account it is very likely that the strong contraction of the abdominal muscles has forced duodenal contents into the stomach. As a matter of fact the records will bear out this statement. In the second place, as Carlson[24] and Boldyreff[25] show, when there is free normal acidity in the stomach for a few minutes the pyloric sphincter dilates and the duodenal contents enter to neutralize the increasing acidity.

As to how long an attack of pellagra lasts, or whether one attack overlaps onto the next attack or recurrence, it does not seem

[24] Loc. cit. [25] Loc. cit.

possible to say. On this account it was not considered justifiable to attempt to correlate the number of attacks or recurrences with the presence or absence of acid and pepsin. On the other hand, the number of years the patient has shown lesions of pellagra is recorded, but this does not throw any light on the subject. For example, Cases 66 and 132 have had pellagra five years. In the former there is a "hypersecretory type" of acidity with normal pepsin, whereas in the latter there is no free acid or pepsin. The same thing is shown in the case of the two children, Cases 219 and 222.

Nesbit[26] says, "The indications are that in pellagra, as in all adynamic and asthenic diseases, the hydrochloric acid and ferments of gastric juice progressively diminish." Three cases have been found which will confirm his finding and show the disappearance of free hydrochloric acid more gradually, and in less time than he reports, with the added disappearance of pepsin.

Nesbit's cases.			Writer's cases.				
Case No.	Date.	Free hydrochloric acid.	Case No.	Date.	Total acidity.	Free hydrochloric acid.	Pepsin.
III.	Aug., 1908	35	51	Feb. 12, 1915	62	52	20
	April, 1909	10		Mar. 9, 1915	62	41	10
	Aug., 1909	4		24, 1915	37	12	10 –
				April 6, 1915	40	18	8
IV.	Aug., 1908	8		21, 1915	46	25	10
	May, 1909	0		June 2, 1915	18	0	0
				Aug. 8, 1915	16	0	0
VI.	Jan., 1908	24	59	Mar. 3, 1915	52	35	25
	June, 1909	0		9, 1915	45	25	25
				26, 1915	27	7	20
VII.	Sept., 1907	39		April 8, 1915	18	0	Tr.
	April, 1908	20		22, 1915	14	0	Tr.
	Oct., 1908	8	77	April 21, 1915	91	68	21
				23, 1915	96	74	16
				May 27, 1915	59	28	13
				28, 1915	53	31	13
				29, 1915	37	17	

Conversely, attention is called to Cases 52, 1 and 9, who were watched over eleven and a half, nine and eighteen months respectively, and practically no change was seen. Case 52 is particularly interesting in that he left the hospital, had a severe attack, and returned between the examinations of June 1, 1915, and November 11, 1915, and is still within limits as to acid and pepsin. Cases 14, 2 and 36 were watched over nine, seven and eleven months respectively, and there was nothing to indicate a return to a normal secretion of the stomach, notwithstanding that from a clinical point of view these patients did not show any obvious symptoms

[26] Loc. cit.

of pellagra at the time of the last gastric examination. This is the only record of which we know concerning such a condition in pellagra.

It is not necessary to consider the dietary of these cases, since no difference was noticed in any of the cases under diets of various sorts.

Johnson,[27] in an examination of 20 cases, found that in 14 lacking hydrochloric acid there was a diarrhea, while in no one case with hydrochloric acid was there diarrhea except in one due to a transient cause. He also seemed to think the diarrhea was lessened if rennin were present. A careful review of our cases does not yield such a consistent relation. We have found diarrhea present both in the presence and absence of free acidity.

The following table gives a *résumé* of the conditions found by the various investigators referred to in this paper:

Authority.	Number of cases.	Free hydrochloric acid.							
		Excessive and normal.		Subnormal.		Deficient.		Absent.	
		No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
Nesbit	10	..	..	2	20	4	40	4	400
Cecconi	10	..	..	..	..	..	..	10	100
Johnson	20	2	10	4	20	..	..	14	70
Myers and Fine	14	2	14	3	21	1	7	8	57
Niles	68	15	23	..	..	31	48	18	28
Hunter, Givens and Lewis	24	8	33	2	8	2	8	12	50
Givens	100	32	32	21	21	8	8	39	39

Although reported previously, Cases 1, 2, 9, 14 and 36 are included in Table II on account of many subsequent observations. Accordingly the number of cases of Hunter, Givens and Lewis[28] has been changed to 24. With the exception of Niles,[29] who does not give the analyses but makes only a summary statement, all of the other cases have been made to conform to the standard set in this paper for normal, subnormal, and deficient acidities. Reviewing the above available data one sees that the variations in a small number of cases are such as would lead often to erroneous opinions, especially in regard to the absence of free hydrochloric acid.

SUMMARY. A careful review of the 100 cases examined, covering over 300 analyses for acidity and pepsin, permits of the following summary:

1. No definite relation can be found between the absence of pepsin and free hydrochloric acid, and sex, age, duration of pellagra, and clinical symptoms.

2. The gastric secretion of children is disturbed along the same general line as that of adults.

[27] Loc. cit. [28] Loc. cit. [29] Loc. cit.

3. Free hydrochloric acid and pepsin do not seem to be absent as often in children as in adults.

4. Although the tendency is for acid and pepsin to disappear hand in hand, such is not always the case.

5. It is believed that pepsin and free acid are present more often than has been expected.

THE INCIDENCE OF CHRONIC FOCAL INFECTION IN CHRONIC DISEASES.

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Although there has been a large amount of literature on the subject of focal infection, the medical profession has been, on the whole, slow to adopt the principles laid down by Rosenow and Billings. On this account I have reviewed briefly what has been done in the medical clinic of the University of California Hospital, hoping to emphasize the importance of this work.

According to this principle many acute and chronic diseases of heretofore unknown origin are believed to be and have in many cases been actually demonstrated to be of bacterial origin. This has been proved by the introduction of new bacterial methods, tissue cultures, and new media which more nearly approach the human tissues from which the bacteria are grown. Tissues which in former years under older methods were found sterile, on culture now yield bacteria in large numbers. The streptococcus in one or the other of its forms has been the most frequently isolated organism. Introduction of these freshly grown cultures of streptococci into animals has shown that the particular organism in question has acquired, to a certain extent, a selective affinity for certain tissues. That is to say, a culture of streptococci from a human stomach ulcer when injected into large numbers of animals will cause a relatively large percentage of stomach ulcers in the animals injected, though many other lesions may also be caused. This strain of streptococcus has acquired an affinity for stomach tissue. The same may be said for streptococci isolated from appendicitis, arthritis, endocarditis, and other lesions. These same organisms isolated from the stomach ulcer may in many cases be found in some chronic focus in the same patient, usually a lesion which does not drain properly. These tooth abscesses, chronic tonsils, sinus and prostatic infections harbor bacteria which must get into the blood stream at such times when the resistance is low and gradually acquire an affinity for some particular tissue which is in time attacked either violently, as is the case in an acute purulent chole-

cystitis, or at recurring intervals, as in the case of the joints. In the case of the more chronic diseases concerned these fresh attacks by bacteria from the focus of infection are synchronous with exacerbations of the disease in the more distant tissues for which the bacteria have acquired an affinity, and these exacerbations are accompanied by such general symptoms as fever, malaise, sweating, weakness, general aching, and anorexia. Such invasions may probably occur without the medium of a particular focus when the general symptoms are the same, but the bacteria do not, as a rule, localize in any particular tissue. As will be shown later we are unable in many cases to locate a diseased focus in many chronic diseases where, according to the principle, one should exist. Then we must either suppose that it has escaped us, that it has already been eliminated, or that some deeper inaccessible structure is serving in its place.

Endocarditis, myocarditis, nephritis, arthritis, myositis, ovaritis, several nervous diseases of hitherto unknown origin, bronchial asthma, ulcer of the stomach and duodenum, cholecystitis, appendicitis, iritis, and erythema nodosum have all been caused in animals by the injection of bacteria grown from chronic foci found on the patients suffering from these diseases.

In the medical clinic of the University of California Hospital we have been especially interested in the subject of focal infection, not only because of its explanation of the cause of diseases whose etiology was hitherto unexplained, but also because of the hopeful field that it opened up as regards therapeutics. There are many limits to the successful and thorough study of such a problem in dispensary work. We must see the large percentage of the patients as ambulatory cases and so lack the advantages of placing them in the hospital for study. We are hampered by the ignorance and poverty of the patients, and especially is the work difficult because of our inability to follow the patients for the considerable length of time which is necessary in order properly to observe results. Our results in a majority of the cases, then, show the coincidence of focal infection with the different diseases studied rather than the clinical cure or amelioration of the disease. In a number of cases, however, the therapeutic results have been very good; in a few cases they have been brilliant. The foci which lend themselves most readily to our work are the teeth and the prostate. We have found that the outward appearance of the teeth is frequently no indication of root abscess, which is almost always surely shown by roentgen plates. Many of the necrotic stumps have tooth abscesses but not all of them do. Crowned teeth may be infected at the roots, but one is sometimes surprised to find a mouth full of crowned teeth that from the roentgen ray all have healthy roots. On two occasions we have insisted on the removal of teeth because the plate showed a distinct area of rarefaction at the root apex, and pus has not been

found. These are accidents which are bound to occur, but we have found that even with a positive report from the roentgen-ray department one should rely on the judgment of a competent dental surgeon when he declares the tooth to be, nevertheless, sound. On one occasion a dentist refused to pull a tooth which had very evidently a root abscess, because the patient had no pain and tenderness about the tooth. Fortunately the dental clinic concurred in our diagnosis and the tooth was removed there. The prostate, of course, lends itself very readily to examination and the presence of pus in the secretion is determined in a moment under the microscope. We have decided the question of infection of the accessory nasal sinuses with the aid of the roentgen ray and the clinical examination in the nose and throat department, though it must be acknowledged that it is difficult at times to say whether or not there is a slight infection here. Tonsils are many times evidently infected. At other times it is impossible to say whether they are healthy or not. Unless they were obviously the site of an infection we have tended to leave these until the other foci were eliminated, generally because of the reluctance of the patients to part with them. We believe them to be a much less frequent focus of infection in adults than in children.

I have gone over the histories of the patients seen in the last two and a half years with the diagnosis of ulcer of the stomach or duodenum. There were 30 of these cases. In 3 the records made no mention of teeth or tonsils; 12, or 44 per cent., had definite alveolar abscesses; 11, or 40 per cent., had carious teeth or enlarged and infected tonsils; 1 had chronic prostatitis, and 4, or 14 per cent., had no demonstrable focus. Thus a chronic focal infection was demonstrated in 13 cases or nearly 50 per cent., and very probable in an additional 40 per cent. In the 4 remaining cases the tonsils were small and smooth; but in view of the known difficulty of determining whether or not a tonsil is infected until its removal it is impossible to say there was no focus. Ulcer patients are almost invariably much benefited by dietary measures, are usually able to go about their work, and soon disappear from view. We have been able in most cases to have the infected teeth removed, but in the short period of observation have found it impossible to say whether the removal of the focus has prevented recurrence of the ulcer. So far no tonsils have been enucleated for ulcer cases, though this should be urged when other foci have been removed and recurrences still occur. It is hoped that in a few years' time many of these patients will return and that more definite data will be obtained as to the effect of the clearing up of these tooth abscesses.

There have been 12 cases of acute or subacute arthritis, and in these are included those patients who complained of aching joints whether there was demonstrable swelling or not. In 8, or 66 per cent., a chronic focus was demonstrated. One of these cases, a subacute, multiple arthritis, cleared up immediately following tonsillectomy,

another cleared up after drainage of an accessory nasal sinus. One of the cases in this group was a girl, aged seventeen years, with a subacute arthritis of the right foot of several months' duration. The joint improved the day after drainage of the alveolar abscess by extraction, and in ten days the patient wore a shoe for the first time in three months. The remaining cases in this group failed to return after diagnosis. In 3, or 25 per cent., there were probable foci in the shape of carious teeth or infected and enlarged tonsils, but the patient failed to return for roentgen-ray examination and was lost track of. Only 1 case failed to show a focus. This was a woman, aged fifty-four years, with syphilis, some pyorrhea, but no definite alveolar abscesses, and small smooth tonsils.

In 40 cases there was a diagnosis of chronic arthritis, and in this group are included all those showing any considerable change in the spine or other joints. These cases form a respectable percentage of the out-patient work, and it seems certain that for some reason in many of them there has been no record of the diagnosis, perhaps because it was a secondary one. Fourteen of these records are incomplete as regards specific statements about teeth, tonsils, prostates, etc., and are therefore omitted from the group, though a good many were described as having all teeth missing, and the fact that the tonsils escaped mention probably means that they were negative. Some of these therefore should be classed in the group in which no focus was found. Twenty-six cases are then left in which the investigation was complete. In nineteen of these, or 73 per cent., a chronic focus was demonstrated, and in this group it was always an alveolar abscess or chronic prostatitis. In an additional 4, or 15 per cent., a chronic focus was probable, that is, the tonsils were infected and enlarged, the teeth in bad condition, but with no record of roentgen-ray examination. In 3 cases, or 11 per cent., there was no demonstrable focus. It is not maintained that in every case of chronic arthritis a focus will be found or that the focus in each case is the actual cause of the lesion in the joints. Many of these patients were sixty or over and are described in the records as having lost all their teeth. From what we see of these people we are almost justified in assuming that they have had one carious tooth after another, one alveolar abscess after another, until finally the last teeth are extracted. The joint changes are undoubtedly initiated many years before the patient is seen at the clinic and have progressed by that time to actual bony change. The most we can hope for at that time is to prevent any further progress by removing what foci are found. The frequently repeated phrase "small atrophied tonsils" found in the records of the physical examinations makes it seem probable that the tonsils are very, very rarely at fault in a patient over sixty, and that in the chronic hypertrophic or atrophic type of arthritis little is to be expected by their removal. Many of the cases of chronic arthritis of the spine are characterized

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by recurring attacks of stillness and pain on movement, sometimes by slight constitutional symptoms which are spoken of by the patient as lumbago. In these a focus will almost surely be found, and most often located in the prostate. These cases do very well indeed after appropriate treatment for the local infection, but this must be persisted in sometimes for months. By eradicating the prostatitis we can prevent the attacks which mark the progress of the disease in the spine, leaving the patient to get along fairly comfortably with what permanent changes he has already acquired. In this connection it is interesting to remember that the spine changes are often overlooked until the sacro-iliac joint becomes abnormally loose, perhaps in an attempt to compensate for the rigidity of the lumbar spine in forward flexion. Abnormal motion or strain in the sacro-iliac joint may cause pain over the joint or down the back of the leg, and this may be what brings the patient to the clinic. Nathan has described, in a recent article, neurological changes found in cases of chronic polyarthritis and spondylitis. These are explained by the epidural exudate which he found on the anterior surfaces of the bodies of the vertebræ and in the intervertebral notches and the resulting nerve pressure. In at least 2 cases of chronic lower spinal and sacro-iliac disease there have been associated neurological changes, in 1 case a loss of the patellar reflex on the side involved, and in another a complaint of spasticity on the side of the sacro-iliac lesion. In another case, that of a young man, there was bilateral loss of patellar and Achilles jerks associated with very marked angulation in the lumbar spine and an absolutely negative spinal fluid examination, although the patient had a perforation of the septum and probable syphilis.

There have been 4 cases of chronic gall-bladder disease, 2 associated with alveolar abscesses, 1 with infected tonsils, and 1 with a chronic protatitis. Most of these cases probably have gall-stones, but the complicating attacks of cholecystitis originate in the chronic focus of infection found so often in the teeth.

A number of other conditions, such as loss of weight, myocardial insufficiency, herpes, headaches, and neuritis, have been found associated with chronic focal infection, but the number in each group is too small to be of any value and the connection perhaps too uncertain.

The figures given above do not, of course, prove any causal relation between chronic focal infection and the various chronic diseases mentioned, but they do show the occurrence together of the two in a large percentage of the cases. As seen in out-patient work the diseases associated with these focal infections are usually well advanced and beyond hope of a cure. The most for which we can hope is to ameliorate symptoms. It is notably in the acute and sub-acute cases that the good results have been obtained, and it is appreciation of this fact that makes this principle a far-reaching one.

Patients who complain of backache, aching joints, indefinite heart symptoms, or who occasionally show albumin, casts, or red blood cells in the urine, should be carefully examined, and foci when found should be cleared up. Such treatment may prevent the final development of chronic polyarthritis and spondylitis, myocardial insufficiency, or nephritis.

In conclusion, 84 per cent. of ulcer patients, 66 per cent. of acute or subacute cases of arthritis, 73 per cent. of the chronic cases of arthritis, and 100 per cent. of the gall-bladder cases have been associated with chronic focal infections. The acute and subacute cases have responded well after removal of the foci, even to the point of absolute cure. The chronic cases, when we have been able to follow them, have in many cases had less pain and no further progression of the disease. A thorough understanding of the principles involved makes clear the nature and cause of diseases hitherto only poorly understood and opens up a more hopeful therapeutic prospect where before we have had to treat symptomatically.

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A REPORT ON THE ELECTROCARDIOGRAPHIC STUDY OF TWO CASES OF NODAL RHYTHM EXHIBITING R–P INTERVALS.

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The rarity of clinical cases of nodal rhythm showing an *R–P* interval seems to us to be sufficient reason for this communication.

The term nodal rhythm is applied to a mechanism in which the seat of impulse formation lies in the *A–V* node or conduction tissues. Although in all hearts the node of Tawara has the inherent power of rhythmic stimulus production, this power is usually kept in abeyance because of the greater rhythmicity of the sino-auricular node, the heart responding to that pacemaker which exhibits the highest rate of impulse formation.

Wilson[1] describes two clinical types of nodal rhythm which, in the sense of Lewis, he calls heterogenetic and homogenetic. The former partakes of the character of a paroxysm of tachycardia with sudden onset and abrupt offset, the heart not under the control of the extrinsic cardiac nerves; the homogenetic type is characterized by a comparatively slow rate, gradual onset and offset, with the heart subject to nerve control.

Our first case belonged to type 1, of which type we find but 6 cases in the literature. These are recorded by Lewis,[2] [3] Rihl,[4]

[1] The Production of *A–V* Rhythm in Man after Administration of Atropin, Arch. Int. Med., 1915, xvi, No. 6, 989–1006.

[2] Auricular Fibrillation and its Relationship to Clinical Irregularity of the Heart, Heart, 1910, i, 306–372.

[3] Paroxysmal Tachycardia Accompanied by the Ventricular Form of Venous Pulse, Heart, 1910, ii, No. 2, 127–147.

[4] Ueber atrioventriculäre Tachycardia beim Menschen, Deutsch. med. Wchnschr., 1907, xxxiv, 632–634.

Cohn,[5] Hume,[6] and Falconer and Dean.[7] The patient was referred to us by Dr. De Witt B. Nettleton, to whom we are indebted for the privilege of publishing the following case history:

CASE I.—W. L. C., male, white, aged fifty-seven years, widower, retired manufacturer.

Chief Complaint. Attacks of palpitation with rapid heart action.

Present Illness. For twenty years patient had had attacks of acceleration and palpitation, lately increasing in frequency. The attacks might come at intervals of every few days, or as often as fifty times in one day. For several months during the past summer the patient had had no attacks, but two weeks ago they had returned. Until recently the attacks seemed to bear no relation to exercise or emotion, but of late they occurred more frequently during fatigue. Although the patient usually walked three or four miles a day, if he walked during an attack extreme fatigue resulted. With the onset of acceleration, there developed an extreme degree of palpitation, and, in the more recent attacks, also a sense of precordial oppression not before present. There was no cyanosis nor dyspnea; no noticeable cough nor edema. Attacks might last a few seconds or for hours, the longest was between three and four hours' duration. Rate during the attack was about 120; the rhythm was regular. If he were standing during an attack, occasionally the patient felt faint. Flatus followed the attacks.

The onset was usually spontaneous, but might be brought on by such change in posture as stooping or by a distended stomach. The palpitation began with a sudden acceleration of heart rate—before this moment the heart beat had been slow, below the threshold of consciousness—the acceleration continued for a variable period, then ceased just as suddenly, was followed by a pause, then a heart thump or two, and finally a resumption of the normal rate without palpitation. The patient can frequently check an attack by holding the breath, by continued deep breathing, or by lying down; these measures, however, are not always efficacious. The effect of vagus pressure was never tried. On the morning of the last examination, lying down caused a short paroxysm, and later a short walk of 300 feet brought on another attack. The patient stated that very rarely was the heart rate accelerated without symptoms.

Past History. Patient had had malaria in early manhood and typhoid at thirty; frequent sore throats but no definite tonsillitis. There had been no scarlet fever nor diphtheria. Renal calculus passed at fifty-two; infection of right kidney followed. He had an

[5] A Case of Paroxysmal Tachycardia, Heart, 1910, ii, No. 2, 170–176.

[6] A Polygraphic Study of Four Cases of Diphtheria with a Pathological Examination of Three Cases, Heart, 1913, v, No. 1, 25–44.

[7] Observations on a Case Presenting a long *A–C* Interval, Associated with Short Paroxysms of Tachycardia arising in the Junctional Tissues, Heart, 1912, iv, No. 2, 137–144.

attack of acute appendicitis, with operation at fifty-three. No cardiorespiratory symptoms between attacks of tachycardia. Troublesome tinnitus was frequent.

Habits. Good.

Family History. Negative.

Physical Examination. Well-developed and well-nourished middle-aged man. Except for the cardiorespiratory-vascular system the examination was practically negative. The heart was not enlarged to percussion. Apex was felt in V interspace about 0.5 cm. to the left of the midclavicular line. Heart sounds were very faint; no murmurs audible; A2 > P2, but not accentuated. There was slight sclerosis of right temporal and radial arteries, not excessive considering the age of the patient. In general the heart sounds were of regular rhythm, although occasionally at the apex a pause approximately equal to the period of two beats was noted. No heart sounds were audible during this pause, which the patient recognized as an irregularity, because of the heart throb which followed. On the first examination of the patient in June, 1916, the pulse rate was 68; the blood-pressure: systolic 118, diastolic 68. On August 1, during the period of acceleration without palpitation or other symptoms, the rate varied between 105 and 120; blood-pressure: systolic 96, diastolic 65. November 22 the pulse rate averaged 95 between attacks, while in two different paroxysmal attacks it was 136 and 122 respectively. The lungs showed a few scattered medium moist rales. There was present moderate stethoscopic edema.

Urine. Acid: 1.015 to 1.020; albumin, 0 to very slight trace; sugar, 0; occasional hyaline cast; slight trace of pus. Phenolsulphonephthalein test 78 per cent. excreted in two hours.

The first electrocardiogram on this case was taken June 20, 1916, at which time the patient had no acceleration of rate (Fig. 1). It showed a normal origin and conduction of impulses with an average rate of 76 beats per minute. The *P–R* interval was 0.16 second; the *P* waves were upright in leads I and II, diphasic in lead III. There was a slight left ventricular preponderance.

August 1 several electrocardiograms were obtained. During the taking of one of these the patient was having an acceleration of rate without any symptoms, such as he said "occurs about once in a thousand times." This electrocardiogram (Fig. 2) showed a simple acceleration with a rate of 107 to the minute. The *P* waves were upright, as before, in leads I and II (the only leads taken), while the *P–R* interval was unchanged, 0.14 to 0.16 second, indicating a normal origin and conduction of impulses. Another plate, taken the same day, showed a rate of 76 with a *P–R* interval of 0.16 second and upright *P* waves.

November 22 the patient was again electrocardiographed during normal periods and during two typical attacks of acceleration, such

as have been described in the case history. During the normal periods the rate varied from 73 to 100, averaging about 95; the *P* waves were upright in all leads and preceded the ventricular deflection by 0.16 second.

During the attacks the rates were 136 and 122 respectively, the *P* wave was invert and following the *R* wave, with an *R–P* interval of 0.1 second. There was no change in the ventricular complex during the paroxysms, the onset and offset of which were abrupt.

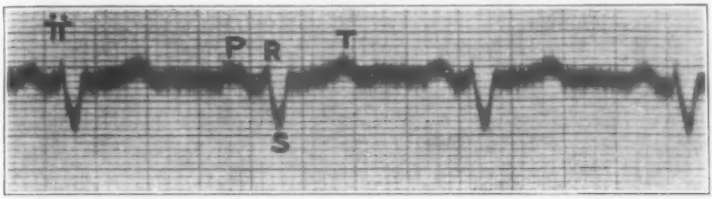

FIG. 1.—(No. 210–1, lead II.) Electrocardiogram of Case I taken during a period of normal mechanism. The rate was 76. *P–R* interval = 0.16 second. The ordinates of all electrocardiograms shown represent 10^{-4} volt, the heavy and fine abscissæ represent time intervals of 0.2 and 0.04 second respectively.

With the return to normal in the last paroxysm the rate dropped suddenly from 122 to 73, the *P* wave became upright, at first low then gradually increasing in height, and there was an immediate return to a *P–R* interval of 0.16 second (Fig. 3). Between the paroxysmal attacks of tachycardia the regular rhythm was occasionally interrupted by a premature beat of junctional origin which showed the normal form of ventricular complex, except that it was

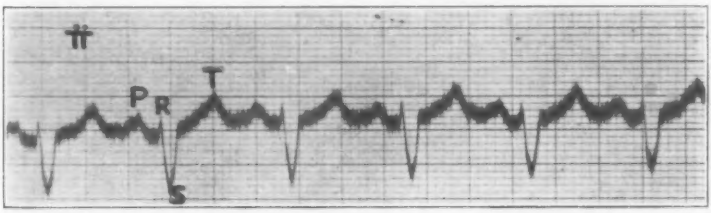

FIG. 2.—(No. 210–5, lead II.) Electrocardiogram of Case I taken during a period of normal mechanism with acceleration. No subjective symptoms. The rate was 107. *P–R* interval = 0.14 to 0.16 second.

of diminished size (Fig. 4). The *P* wave was invert and followed the *R* wave by 0.1 second. The pause following the premature beat was almost compensatory. During these premature beats no sounds were heard over the precordium and no pulse could be felt at the wrist.

The second case described cannot be definitely classified. There

are several points in favor of the impulse formation being of heterogenetic type, others in favor of a homogenetic origin. The nodal rhythm developed while the patient was under ether anesthesia,

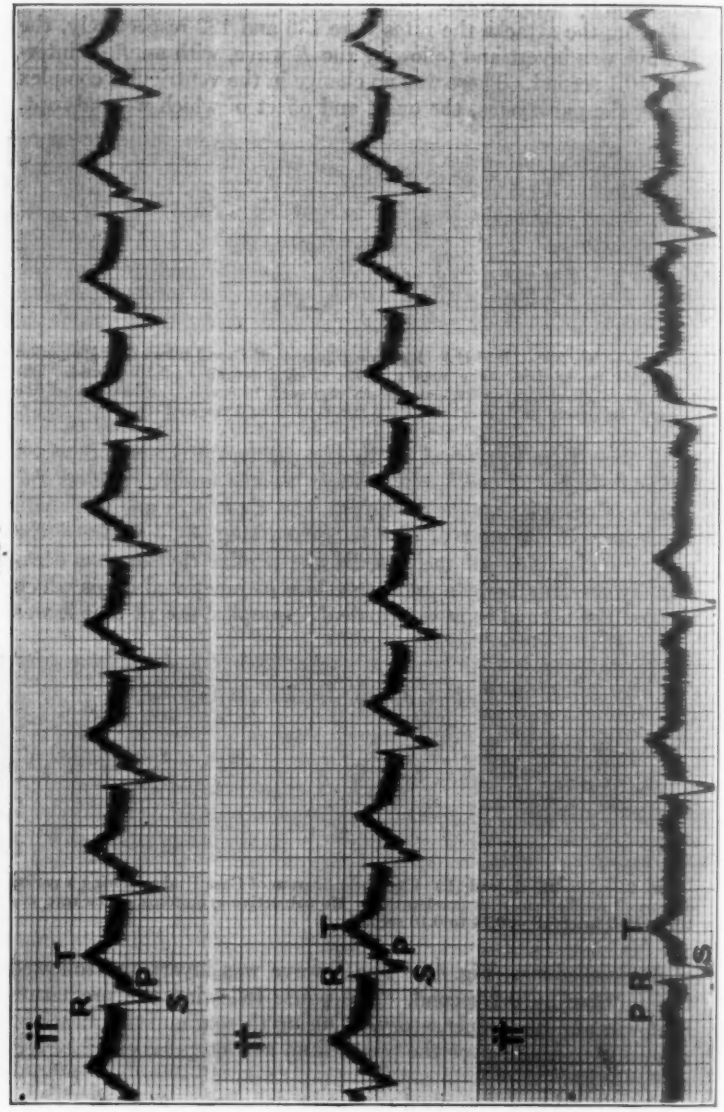

FIG. 3

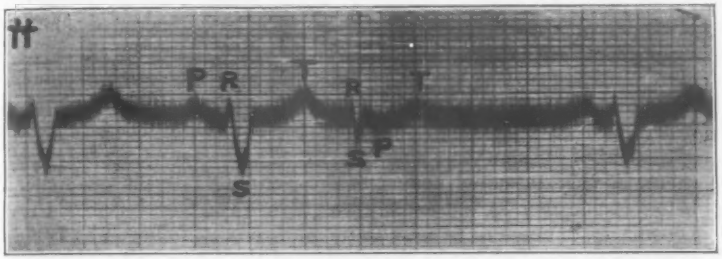

FIG 4.—(No. 210–10a, lead II, film.) Electrocardiogram taken a few minutes after Fig. 3. A junctional premature beat is shown in which the ventricular complex is smaller than but of the same general conformation as that of the normal cycles, the *P* wave being invert and following the *R*.

and neither the onset nor offset of the abnormal mechanism was observed. The clinical history of this case follows:

CASE II.—Mrs. M. W., aged thirty-six years, white; married; housewife. Admitted to St. Francis Hospital, service of Dr. H., January 2, discharged January 30, 1917.

Chief Complaint. About fourteen months before admission patient had noticed gradually increasing general weakness, which became so marked that any effort caused extreme fatigue; she had been confined to her home during that period, spending most of the time in a chair or in bed. The weakness had steadily increased despite rest in bed and medical treatment. For two and one half years preceding she had noticed occasional weakness, but it had not been so severe. About eight months before coming to the hospital the patient tried to increase effort and took two walks of about 300 yards each; both were followed by a "fainting attack" similar to others she had had for the past sixteen years. These attacks always began with a feeling of thoracic oppression, as though there was a weight on the chest; patient's lips and fingertips became very cyanotic; a cyanotic lacework appeared over the skin; the hands grew cold; and patient became very dyspneic and weak. Because of weakness she had accustomed herself to lying down; she had lost consciousness only two or three times, and that many years before. She never had had convulsions, but attacks

EXPLANATION OF FIG. 3

(No. 210–10, lead II.) Electrocardiogram of Case I taken during a typical attack of paroxysmal tachycardia. The entire figure is of lead II, the three parts being taken in immediate succession. The end of the paroxysm occurred while the camera plate was being raised for the taking of the third portion of the figure. The postparoxysmal pause was observed but not recorded. A period of about five seconds elapsed between the end of each third of the figure and the beginning of the succeeding third. The heart rate during the paroxysm was 122 with an *R–P* interval of 0.1 second. The rate after the paroxysm was 73 with a *P–R* interval of 0.16 second. Note the similarity of the ventricular complex during and after the attack, except as it is modified by the superimposition of the invert *P* during the paroxysm. There is a progressive increase in the height of *P* immediately following the paroxysm.

ended with a "nervous chill." During these attacks, because of the dyspnea and weakness, patient lay in a semicomatose condition, knowing what went on about her, but unable to speak. The extreme dyspnea usually lasted from fifteen minutes to an hour, during which time there was gradual improvement. The weakness lasted two or three days. During these attacks, according to statement of husband, the pulse was usually "better" than between them; by this statement he means stronger and faster; it was never below 44 nor over 60, but usually irregular. The description of this irregularity is much like that of a premature beat, followed by compensatory pause, while the description of the irregularity of pulse noticed between attacks is more like an actual "missed beat." Pulse has been slow during the patient's entire life, usually below 60. Last year, for one month, pulse is said to have been constantly between 18 and 25, and was noted on several occasions by her attending physician at these rates. She never has had palpitation nor edema. For years she has had slight unproductive cough, not increased with dyspnea. Her nervousness had been noticed for seven years; she became easily excited and had "internal quivering," followed by increased weakness and dyspnea. Frequently she had paresthesia of arms and legs, usually bilateral, but never any local paresis nor paralysis. The paresthesia usually lasted fifteen to twenty minutes, and was often, though not always, associated with dyspnea. Recently the feeling of "pins and needles" had been noticed whenever the patient awoke at night. There was always dysmenorrhea; menses were irregular. The "cardiac attacks" noted above usually come just before or just after the menstrual period. Nycturia once; diuria 6 to 7. No dysuria nor hematuria; chronic constipation; occasional gaseous eructation. For the past six months the patient had had an eruption on the face.

Past History. Measles, mumps, and varicella as child. At the age of two years the left eye was injured and the sight of this eye was destroyed. Frequent attacks of tonsillitis until ten years ago, when they ceased.

At sixteen years had the first "fainting attack," similar to that described in present illness. These attacks had occurred about twice a year since that time, but more often since present illness. There had been frequent partial aphonia since girlhood.

At nineteen years, she had a severe hemorrhage, but whether gastric or pulmonary was not known, and no details were obtainable.

In 1911 she had left-sided dry pleurisy and a "nervous breakdown," because of which she was in a hospital for fifteen weeks.

For twenty years has had dyspnea on slight exertion (one flight of stairs) even between attacks.

Occupational History. School teacher and supervisor for sixteen years until two years ago; since then has had household duties. She always worked very hard.

Family History. Practically negative. Married two years. Never pregnant.

Physical Examination. Slightly built, poorly-nourished woman lying flat in bed in no discomfort. Skin of left half of face showed many discrete and confluent dark red papules; only one papule on right side of face.

Mucous membranes of good color; not cyanotic.

Left eye showed internal squint; patient could only distinguish light with this eye.

Oral cavity and throat negative, save for crowded teeth and dental work.

Lungs were negative.

Heart outline was small to percussion. R. B. D., 3 cm.; L. B. D., 7 cm. from midsternal line in IV interspace. Apex felt in fourth space, 7.5 cm. from midsternum. Supracardiac dulness 4.5 cm. wide. Heart sounds were of good quality, regular except for a very rare "missed beat," during which pause no sounds were audible over precordium. This pause was about twice the length of that between the regular beats. At pulmonic area a soft, blowing systolic murmur was audible; not transmitted. P2 > A2 not accentuated. No thrills. Pulse was of fair volume and low tension; the walls of the radials were not sclerosed. Rate, 56 to 63. Blood-pressure: systolic, 100; diastolic, 60.

Abdomen: Negative. Knee-jerks: Lively. Extremities: No edema.

Pelvic examination by Dr. Huggins revealed an infantile anteflexed uterus and undersized ovaries.

Laboratory Findings. Blood: Hemoglobin, 80 per cent.; red blood cells, 4,460,000; white blood cells, 7400. Morphology of reds and differential essentially normal.

Urine: Negative.

Phenolsulphonephthalein test: Sixty-seven per cent excreted in two hours.

Wassermann (blood): Positive.

Wassermann on husband's blood negative (never received antispecific treatment).

Course. Temperature usually subnormal.

Pulse varied from 40 to 126, usually between 40 and 70 with a tendency to remain at about 60. During most observations the pulse was regular except for the occasional presence of a long pause, during which no heart sounds were audible. The frequency of these pauses varied from day to day, sometimes recurring every few beats, at other times unrecognizable during a prolonged period of observation. When the pauses were most frequent the pulse was slowest. The slowest rate observed by writers was 41, although the husband is said to have observed a rate of 32 shortly previous to this time.

January 20, under ether, patient had dilatation and curettage of uterus, with introduction of stem pessary by Dr. Huggins. The

pulse and blood-pressure findings at this time will be given in Table I. Pessary later came out and was reinserted January 27 without ether. During stay in hospital patient complained of general weakness like that which had preceded admission. She had several periods of paresthesia, as previously described, but objective examination at such times revealed nothing definite.

The results of electrocardiographic examinations will be discussed in the body of the paper. Patient discharged January 30, only slightly improved.

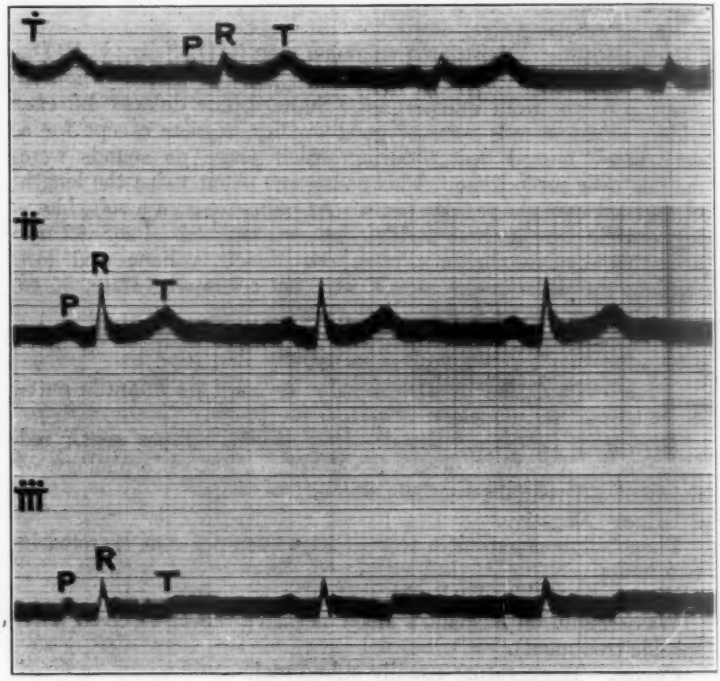

FIG. 5.—(No. 308–11, leads I, II, III.) Electrocardiogram of Case II taken during a period of regular heart action. There is a slight sinus arrhythmia. Rate = 55. *P–R* interval = 0.16 second.

On seven different occasions during the stay in the hospital, electrocardiographic examinations were made. On all these occasions, except while the patient was under ether, the electrocardiograms showed a marked sinus arrhythmia, frequent sino-auricular heart-block, and bradycardia (Figs. 5 and 6). The slowest rate obtained by electrocardiograph was 41, the longest *R–R* interval was 2.04 seconds. The *P–R* interval varied from 0.16 to 0.18 second during the normal rhythm. The *P* wave was

always upright in leads *I* and *II* and upright or diphasic in lead III. In the electrocardiogram taken immediately after the operation, January 20, while the patient was still under complete ether anesthesia, the mechanism was different from that at any other

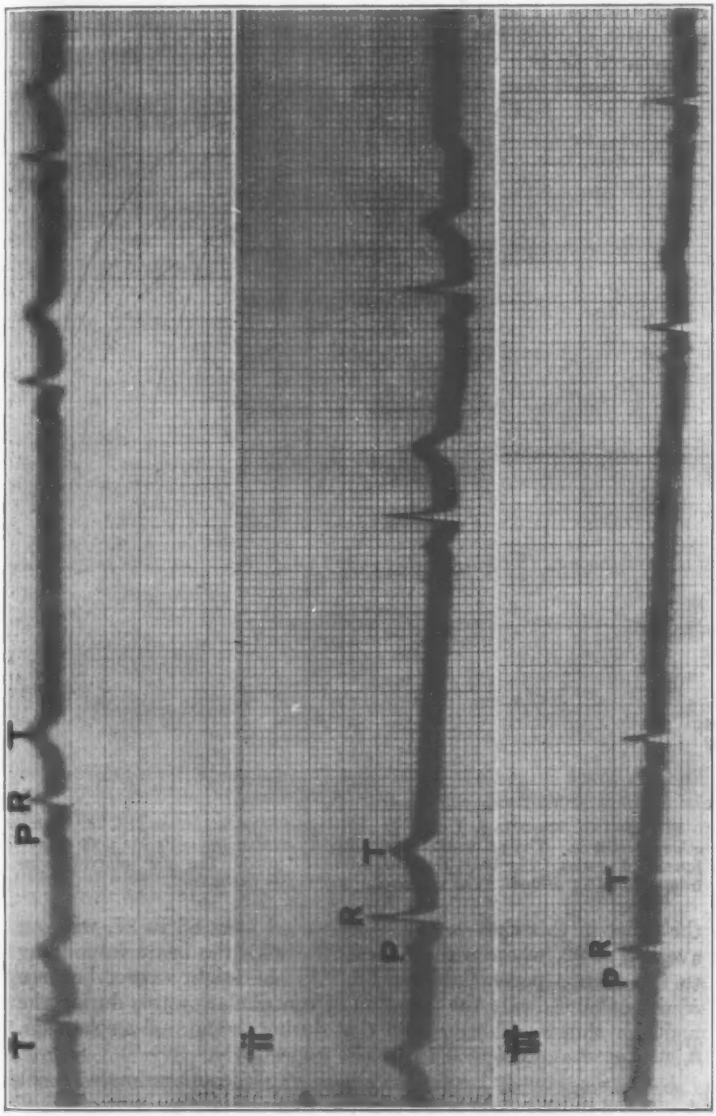

FIG. 6.—(No. 308-12, leads I, II, III.) Electrocardiogram of Case II taken during a period of slow and irregular heart action. There is evidence of frequent sino-auricular block. The average rate is 41, the longest *R–R* interval = 2.04 seconds. The *P–R* interval = 0.16 to 0.18 second.

examination (Fig. 7). There was no marked change in the ventricular complexes except that the *R* waves were slightly higher, while the *T* of lead III tended more toward inversion. The *P* wave, however, instead of preceding the *R* followed it with an *R–P* interval of 0.06 to 0.1 second. The contour of the *P* was also changed, for in this plate it was of smaller amplitude and shorter duration, while in all leads it varied from upright to diphasic. The rate of

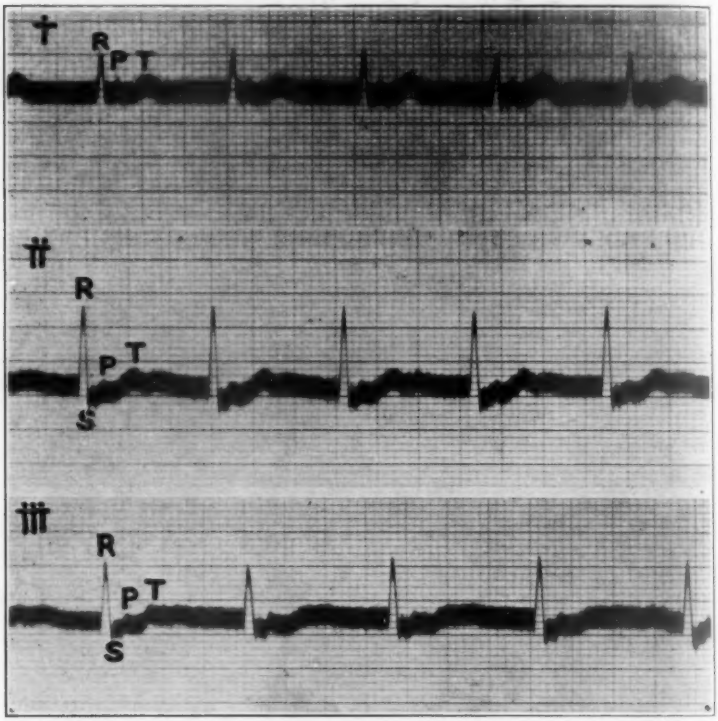

FIG. 7.—(No. 308-8, leads I, II, III.) Electrocardiogram of Case II taken during ether anesthesia. The pacemaker has shifted from the sino-auricular node to the junctional tissues. The heart rate varies from 97 to 83. The *R–P* interval varies from 0.06 to 0.1 second. The ventricular complex is unchanged.

the heart in this electrocardiogram varied from 83 to 97, with an average of 92, whereas the fastest rate with the heart responding to the normal pacemaker was 63. As one might expect because of the enhanced rate the duration of ventricular systole during the nodal rhythm was shorter than that during the normal mechanism, 0.28 to 0.32 and 0.4 to 0.44 second respectively.

Unfortunately the record taken during the operation was not developed until several hours later, so that the change in mechanism

was not known at once. For this reason the series is not so complete as it might be desired. As soon as it was known there had been a shifting of the pacemaker the patient was again electrocardiographed, but not until five hours after the preceding plate had been made. Meanwhile there had been complete recovery from the anesthetic. This latter group of plates showed a return to the normal mechanism, the *P* upright in all leads, *P–R* interval 0.14 to 0.16 second, the rate 63, with a slight sinus arrhythmia, but no evidence of sino-auricular block. All the deflections at this time were very small. The next electrocardiograms showed a return to the condition before the operation, a condition that persisted throughout all remaining electrocardiograms.

A table of the pulse and blood-pressure readings on the day of operation may be of interest (Table I). There was a marked variation in the intensity of the systolic sounds over the brachial artery while blood-pressures were being taken during the operation. The intensity varied with the phases of respiration, being much the louder during inspiration. This phasic variation was most marked during early anesthetization, but it persisted throughout the period of etherization and for some time thereafter.

We have already stated that the first case cited was of the heterogenetic type. The fact that the paroxysms could sometimes be stopped by the patient either by holding the breath or by rapid, deep breathing would seem to indicate that the control of the extrinsic cardiac nerves was not entirely lost. However, as these effects were inconstant, we must beware of the *post* and *ergo propter* fallacy. The other criteria for the recognition of junctional paroxysmal tachycardia, namely, rapid rate, sudden onset and offset, shortened, absent, or negative *P–R* interval, inversion of *P*, normal ventricular complex, and postparoxysmal pause were all present.

In the second case neither onset nor offset was pictured or observed. From the pulse rates as given in Table I, because of the length of the intervals between observations, we cannot be certain whether or not the change was sudden. However, inasmuch as the rate during the taking of the electrocardiogram varied from 97 to 83, while there was a general tendency toward a gradual fall both before and after the electrocardiogram was taken, the supposition is that the change was not abrupt. The rate, although much more rapid than during response to the sinus pacemaker, was not excessively rapid when the electrocardiogram was being taken. However, it may be presumed that the nodal rhythm was also present at an earlier stage of the operation when the rate was 120. From the data at hand we cannot determine whether the rhythm in this second case was of heterogenetic or homogenetic origin. However, as the latter origin is much the more common we favor the supposition that the disturbance was of the homogenetic type in spite of the fact that the comparatively rapid rate is in favor of the former.

TABLE I.

Jan. 20, 1917. Time.	Systolic.	Diastolic.	Pulse-pressure.	Pulse rate.	Character of pulse.	Notes.
9.00 A.M.	104	66	38	63	Regular	Before operation.
9.30	..	..	..	..	..	Morph. sulph. gr. $\frac{1}{4}$; atrop. sulph. gr. $\frac{1}{50}$.
10.30	..	..	..	80	Regular	Ether begun.
10.50	112	95	17	120	"	Partial anesthesia.
10.53	140	110	30	110	"	Partial anesthesia.
10.55	125	110	15	114	"	Complete anesthesia
11.00	132	70	62	126	"	Dilatation of cervix begun.
11.05	130	65	65	123	"	Curettage.
11.08	..	..	..	95	"	Operation finished.
11.10	..	..	..	..	..	Electrocardiogram taken; complete anesthesia.
11.15	135	95	40	..	..	Patient removed from table.
11.30	..	..	..	90	"	Patient in her room.
11.40	..	..	..	80	"	
12.00	..	..	..	64	"	Patient partially recovered from ether.
12.05 P.M.	..	..	..	70	"	
12.30	..	..	..	80	"	
12.40	..	..	..	68	"	
12.50	..	..	..	70	"	
1.05	110	70	40	60	"	Still drowsy from ether.
1.15	..	..	..	68	"	
1.25	..	..	..	70	"	
1.55	..	..	..	68	"	
2.20	..	..	..	68	"	
4.15	100	65	35	68	"	Completely recovered from ether; electrocardiogram taken.
6.00	..	..	..	..	..	Morph. bimeconate, gr. $\frac{1}{3}$ s.c.
8.00	..	..	..	60	"	Feeling comfortable.

The question of etiology is an interesting one—several factors require consideration. Thus the patient had been given a hypodermic of morphin (gr. $\frac{1}{6}$) and atropin (gr. $\frac{1}{150}$) one hour before etherization was begun. We know of no observations in regard to morphin administration in connection with observed instances of shifting of the pacemaker to the conducting tissues. The case is different with regard to atropin. Thus, Wilson was able to induce nodal rhythm by vagus stimulation in normal persons who had received preliminary injections of atropin (1 mg.). This result could usually be obtained only when stimulation was applied eight to twenty minutes after the injection. In our case the electrocardiogram was taken one hour and forty minutes after the injection, and but twenty minutes after the marked rise in rate noted in Table I. This suggests that the shifting of pacemaker was not

the result of the morphin-atropin injection alone. Furthermore, the administration of the morphin-atropin mixture is a routine measure preliminary to operations in St. Francis Hospital, and no other cases of nodal rhythm have been observed by us over a series of 21 cases in which electrocardiograms have been taken during anesthesia. That asphyxia is capable of causing a shifting of pacemaker to *A–V* node has been shown by Lewis, White, and Meakins[8] who induced nodal rhythm in cats by this method. However, since our patient took the ether well and at no time showed any signs of asphyxiation we must look further for the cause of the changed mechanism. Wilson[9] cites 3 cases in which forced respiration caused the pacemaker to change from the *S–A* to the *A–V* node. As the respirations were increased under ether administration this forcing may have been a partial factor in the changed mechanism. However, the data is too scanty to permit of definite conclusions being drawn. The effect of the ether itself is not fully known, but our other cases show that, at least, it is not commonly a cause of *A–V* rhythm.

In most cases of nodal rhythm the *P* is invert; but its inversion is not an essential characteristic. Thus Meakins[10] has shown that the *P* wave may be polyphasic, and that in only 8 of his 9 experiments did the auricular complex begin with a downstroke. Lewis and Allen[11] have described a case of premature beats arising in the *A–V* tissues in which case the *P* wave was upright and of normal contour; from this fact, together with the varying *P–R* intervals, they conclude that the auricles were responding to the normal pacemaker while the ventricles were responding to an impulse arising low in the *A–V* bundle. This case, however, is not analogous to ours. In our first case the *P* wave was invert; it was upright or diphasic in our second. We believe that both are true cases of nodal rhythm, the auricles and ventricles both responding to the new pacemaker.

Wilson divides each of his previously mentioned types of nodal rhythm into three subtypes dependent upon the origin of the impulse: (1) those with a shortened *P–R* interval, *P–R* 0.1 second or less; (2) those in which the *P–R* interval is absent, *P–R* equals 0; (3) those in which the *P–R* is negative, that is, changed to an *R–P* interval. The origin is supposed to be progressively lower in the auriculoventricular tissue in types 1 to 3; the latter is the lowest and also clinically and experimentally the least common. White[12] believes that an *R–P* interval may be due either to a low

[8] The Susceptible Region in *A–V* Conduction, Heart, 1914, v. No. 3, 289–298.

[9] Three Cases showing Changes in the Localization of the Cardiac Pacemaker Associated with Respiration, Arch. Int. Med., 1915, xvi, No. 1, 86–97.

[10] Experimental Heart-block, with Atrioventricular Rhythm, Heart, 1914, v, No. 3, 281–288.

[11] An Instance of Premature Beats arising in the Auriculoventricular Bundle of a Young Child, Am. Jour. Med. Sc., 1913, cxlv, No. 5, 667–671.

[12] A Study of *A–V* Rhythm following Auricular Flutter, Arch. Int. Med., 1915, xvi, No. 4, 517–535.

position in the *A–V* tissues or to resistance in the auriculonodal junction or to both together. Hering,[13] however, has shown that the greatest delay in conduction through the junctional tissues occurs in the node of Tawara. The general belief is that with an *R–P* interval the origin of impulse is in or below the node. In both the cases we have described in this paper there was an *R–P* interval indicating a low origin in the junctional tissues; likewise, in both cases the ventricular complexes were unchanged, except for modification by the superimposition of the *P* wave, indicating that the impulses originated above the division of the main stem of the His bundle.

The slow rate of the sino-auricular rhythm in the second case is interesting in conjunction with the case of junctional paroxysmal tachycardia described by Lewis, in which the rate between attacks was usually about 50, with an occasional rate as low as 37. In regard to that case Lewis said that the slow rate occurred during a "sinus arrhythmia." Although the published curves do not show a sino-auricular block, we are led to question whether such a block were not occasionally present as in our case.

Eyster and Meek[14] have shown that the average rate of rhythmic discharge of the auriculoventricular tissues in dogs is about 67 per cent. of that of the sino-auricular node; in cats the relationship is closer but the rate is still below that of the *S–A* node; in man the automatic rhythmicity of the nodal tissues is likewise lower than that of the normal pacemaker. Hence, White suggests that when the rate of a nodal rhythm is rapid, that rapidity indicates more than a mere depression of the sino-auricular node; it indicates stimulation of the auriculoventricular tissue. The fact that the rates during nodal rhythm in both of our cases were high compared with the rates during the normal mechanism points therefore to some abnormal stimulation of the new pacemaker.

SUMMARY. Two cases are presented in which electrocardiographic study showed the development of transient nodal rhythm. The first case exhibited junctional premature contractions and typical attacks of paroxysmal tachycardia such as had extended over a period of twenty years; the second presented marked sino-auricular block, and under ether anesthesia there developed a paroxysm of auriculoventricular rhythm.

During the paroxysms of abnormal rhythm there was present in both cases an *R–P* interval indicating an origin of impulses low in the conduction tissues. The comparatively rapid rates during the paroxysms of auriculoventricular rhythm suggest an abnormal stimulation of the junctional tissues.

[13] Nachweis, dass die Vergögerung der Erregungsüberleitung zwischen Vorhof und Kammern des Säugerthierherzens im Tawaraschen Knoten erfolgt, Arch. f. d. ges. Physiol., 1910, cxxxi, 379–401.

[14] Experiments on the Origin and Conduction of the Cardiac Impulse. VII Sinoventricular and Sino-auricular Heart-block, Arch. Int. Med., 1917, xix, No. 1, 117–139.

PATHOGENESIS OF INFANTILE SCURVY: AN HYPOTHESIS.*

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I. Etiology. Originally infection and toxemia played prominent parts in the theoretical etiology of scurvy, but during the past two decades there has been practically universal agreement among individuals working on the problem of scurvy that it is not due to an infection or to a toxemia, but to the destruction of some substance in the diet whose presence is necessary to prevent the development of the characteristic scorbutic symptoms. However, during the past year Jackson and Moody[30] reported observations which, according to McCollum,[44] are suggestive of the presence of a toxic substance of bacterial origin injuring the bloodvessels. McCollum[44] himself very recently stated that he is convinced that guinea-pigs on a diet of oats and milk suffer from scurvy because of the constipating character of the diet. I personally doubt, however, whether McCollum's guinea-pigs had only scurvy, as he characterizes his animals as having badly swollen joints and hemorrhages of the gums. These symptoms in the experience that I have had with some 150 scorbutic guinea-pigs during the past year and a half do not seem to me to be characteristic enough to permit a diagnosis of scurvy. It has been my experience, both in guinea-pigs fed according to the direction of Holst and Fröhlich[27] on the one hand and Jackson and Moore[29] on the other, that the animals fail to show what I should wish to call hemorrhages of the gums. This experience coincides with that of Holst and Fröhlich,[27] who did not find in their pigs hemorrhages of the gums as we see them in the human being. They did find, however, that the molar teeth became loose and were readily extracted. It seems to me probable that the beneficial results which McCollum and Pitz obtained by liberally dosing their guinea-pigs with liquid petrolatum will more readily fit into the clinical, therapeutic and pathogenetic picture of rickets or pseudo-rickets, as we know them at the present moment, than of scurvy. As Hart [15 16 17] states, it is impossible to know without a microscopic examination of the bone whether in scurvy cases showing swellings that resemble those seen in rickets only one disease or both diseases are present. I think, however, that this statement of Hart's may in certain cases be modified by the roentgen rays. Aside from McCollum and Pitz and Jackson and Moore, most men, such as Funk,[11 12] Vedder,[52] Braddon and Cooper,[3] Holst and Fröhlich,[27] Schaumann,[47] Hart,[15 16 17] Hess,[19 22] Fröhlich,[10] Fürst,[14] Budd and

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Busk,[14] and others, are of the opinion that the disease is a "deficiency" disease, due to an absence or inaction of one of the so-called "vitamines," "accessory growth factors," or one of the known food constituents.[43]

II. Clinical Picture. The clinical picture of scurvy has been controlled until recently by two symptoms, namely, hemorrhages into the bones and tissues and rarefaction and swelling of the osseous system. In 1914 Darling,[8] however, in his articles on "The Pathological Affinities of Beriberi and Scurvy," called attention to the distinct similarity between scurvy and beriberi in the production of some symptoms. He pointed out the presence in scurvy of exaggerated reflexes, tachycardia and dilatation of the heart. On microscopic examination he found fatty degeneration of the heart muscles and also degeneration of the vagus, while the other heart nerves were free from any lesion whatsoever. According to Lesage,[33] he and various other French authors as early as 1906–8 recognized the hyperesthetic form of scurvy which at times was clinically negative in every other respect and was diagnosed by its prompt response to antiscorbutic treatment. At the beginning of this year Hess[22] reported similar findings. So at the present time we have, from a clinical stand-point, symptoms that are referable to changes in the bloodvessels, in the osseous system, the nervous system, and the muscular system.

III. Pathogenesis. Hart [15] [16] [17] states that while on the one hand there is no doubt as to scurvy being a disease *sui generis*, yet there is, on the other hand, no settled opinion as to whether one and the same agent or process is responsible for the changes in the bones and the bloodvessels or whether they are due to different agents or whether they are interdependent upon each other. But it has seemed to me, in view of the known data regarding the pathology, chemistry and symptomatology of scurvy on the one hand, and regarding the important function played by calcium in bone growth, nerve conduction, vessel sealing, and cell permeability on the other, that all of these different system symptoms might be explained on the common basis of an interference with one or more of the normal functions of calcium and its physiological anion in the osseous system, vascular system, nervous system, muscular system and probably other systems.

So I have imagined the following:

1. That all of the symptoms of scurvy as we know them today may be explained on the common basis of a primary or secondary interference with one or more of the normal functions of calcium, alone or in conjunction with its physiological anion, a condition which I am pleased to call *a partial defunctioning of calcium and its physiological anion*. The work of Heubner[24] and Lipschütz,[34] namely, shows that for the ascorbutic development of the osseous system the presence of phosphorus in sufficient quantity is necessary.

2. That in scurvy as we see it occur in infants this defunctioning is caused by a substance produced through a break in the metabolism of carbohydrates, whatever their original source may be.[52]

3. That the break in carbohydrate metabolism occurs, as already suggested by Funk,[12] Braddon and Cooper[3] and others, as a result of the absence or inactivity or relative insufficiency or inadequacy or some physicochemical substance or "vitamine" essential to the establishment and performance of normal carbohydrate metabolism, possibly in the role of a catalyzer, as suggested by Schaumann,[47] as quoted by Holst and Fröhlich.[27]

4. That the defunctioning substance produced as a result of the break in the metabolism of carbohydrates due to a disproportionment between the carbohydrate supply on the one hand and the "vitamine" supply on the other, possibly is oxalic acid or some other agent that has a similarly strong affinity for calcium, and that after combining with calcium is soluble with similarly great difficulty.

There is, to my knowledge, no function whose perfect operation depends solely upon the presence and actions of only one and the same factor, and there is also, to my knowledge, no disease that is produced in every instance by the action of only one and the same factor.

A normal function can be pictured as an intact circle of links, and an abnormal function or disease has a circle of links broken in one or more of its links. Various and numerous circumstances and conditions will determine the link or links that usually break and produce a disease in a given environment, but occasionally in the same environment an entirely different link will break and, in consequence, just as successfully make impossible the performance of the same function in a normal manner and just as successfully develop the same disease, at least in its more important symptoms. Clinically the abnormal function may present itself to us in both instances in exactly the same picture, but it also is possible that the picture be different in some particulars while the same in others.

A good example of this in experimental scurvy has been given by the work of Heubner and Lipschütz referred to above. These authors fed dogs on a phosphorus-low diet and produced lesions, which, according to Schmorl,[48 34 24] are identical with the most characteristic lesions found in classically scorbutic bones, and yet the scorbutic bone lesions that we see in infants are often produced in a child on a diet whose phosphorus content is high rather than low, and in this latter instance, simply because, in all probability, for one reason or another, the phosphorus is prevented from performing its normal function in bone growth. This work of Lipschütz and Heubner, I believe, proves that phosphorus, at least so far as normal bone growth is concerned, is just as necessary as is calcium, and so I think that one can readily agree with the statement made by Masslow,[41] quoted by Baumann and Howard,[2] namely, that in the pathogenesis

of the disturbances of the osseous system phosphorus plays a distinct role. Whether phosphorus joins calcium in a similar fashion in the function of sealing vessels or conducting nerve impulses, so far as the clinical picture and lesions of scurvy are concerned, is another question which cannot be answered at this time.

In connection with the work of Heubner and Lipschütz it should be stated that Walter Löb[39] is of the opinion that the presence of phosphates is necessary for normal glycolysis. However, as the sick dogs of Heubner and Lipschütz gained decidedly in weight while they were producing their own lesions it would seem, to say the least, that even the small quantities present in the diets of the dogs were sufficient to meet the glycolytic phosphorus needs of their bodies.

That calcium, however, has a distinct function to perform in the sealing of vessels and nerve conduction there can be no question, as the work of many authors shows. Chiari[5] has proved that saline cathartics act by increasing the permeability of the vessel wall by binding with their calcium and so extracting it from them. In another study it was possible for him and Januschke,[7] by a protective injection of calcium, to prevent the formation of an exudate on the conjunctiva of a rabbit into whose eye a drop of mustard oil was dropped. Overton,[46] quoting Herbst, states that the sealing substance in the tissue cells of certain animals is loosened by the removal of calcium and tightened by the readministration of calcium, and Januschke[36] was able to prevent the appearance of the usual and characteristic pleural exudate in iodin poisoning in dogs by the giving of calcium. Sir A. E. Wright[57] also found that calcium could prevent the development of certain urticarias, and he was inclined to attribute this beneficial effect of the calcium to the increased coagulability of the blood produced by it. Chiari and Januschke[7] took up this point and proved that the vessel-sealing function of the calcium was not the same as the one it performed in the coagulation of the blood; in other words, that it could perform the one without performing the other. These authors proved this by injecting hirudin into a rabbit that had been pretreated with calcium. Two hours later mustard oil was dropped into the eye and no exudate resulted, even though the coagulation time of the blood was kept distinctly below normal by the hirudin.

Hess[19] has shown that infants with scurvy show on the one hand a practically normal coagulation time, and on the other an increased permeability of their vessel walls as tested by the capillary test. While, as Hess states, this test is not pathognomonic of scurvy, as it occurs in many other conditions, yet it seems to me that its apparently constant presence in a marked form in scurvy makes it speak for the existence of an increased permeability of the vessel walls in scurvy. Holst and Fröhlich[27] fed their guinea-pigs calcium in different forms without getting any beneficial effect. Likewise

Ingier[28] did not succeed in checking the development of the scorbutic phenomena in pregnant guinea-pigs by adding phosphorated cod-liver oil to the diet, and Hess[19] reports the same negative results with infants. I also have given large doses of cod-liver oil with tricalcium phosphate to a florid case of scurvy absolutely without any beneficial effect (5 c.c. of cod-liver oil containing 20 per cent. tricalcium phosphate, twice daily for eight days). So that it is clear that the lessened permeability of the vessel wall in scurvy is produced in a manner that, in some particular at least, is different from that operating in the experiments carried out by Chiari and Januschke[5 7 31] and others.[32] Nevertheless, it is true that the vessel walls in scurvy are more permeable than normal, and also that calcium plays an important part in sealing the vessels, and so, in view of the additional fact that a disturbance in the calcium metabolism exists in scurvy, it still would seem possible that somehow an interference with the vessel-sealing function of calcium is responsible for the increased permeability of the vessel walls in scorbutic infants.

Chiari and Fröhlich[6] have further demonstrated that the autonomic nervous system is stimulated by the removal of calcium. This removal of calcium was produced by oxalates, and Januschke[31] showed that calcium antagonized this action of oxalates. H. H. Meyer,[45] in a short address referring to the work of the just-mentioned authors, states, "Our experiments prove two things: (1) a sedative action of the calcium on the vegetative nerve apparatus, and (2) a lessening of the permeability of the vessel wall."

Burridge,[4] in his very important experiments "On the Localization of the Calcium and Potassium Salts Concerned in the Mediation of the Action of the Vagus Nerve on the Heart of the Frog," definitely has found that "calcium salts are essential to complete passage from the preganglionic nerve fibers to the heart ganglia and that potassium salts favor the action of the terminal structure concerned in vagus action." He also states that the calcium salts, mediating the action of the vagus nerve on the frog's heart, form an integral part of the structure, whatever it may be, on which the nicotin acts. He further quotes the work of Chiari and Fröhlich, Meyer and Januschke, mentioned above, and that of Elliot,[4] who pointed out certain analogies between the synapses of the autonomic nervous system and the nerve endings of skeletal muscles. So these experiments also prove not only that calcium has an important function to perform in the transmission of nerve impulses, but that its defunctioning can produce symptoms such as we see presented in the heart and in the nervous systems of patients ill with scurvy and beriberi. Finally, it is well to call attention to the extremely important work of Jacques Loeb[35 36 37 38] and his co-workers regarding the function of calcium and other salts in cell permeability and irritability. He has proved[37] for calcium that the two functions are not the same and that in order to perform one

certain conditions must be different than are present for the operation of the other.

None of the cases of scurvy that I personally have seen have shown a hyperexcitability to the galvanic current, and none of the cases of spasmophilia that I have tested have shown an increased permeability of their vessel walls, proving that while in each case there is a disturbance in the function of calcium, yet the clinical reaction to the same tests may be entirely different in each case. Of course, cases will be, or possibly have been, observed that show signs both of scurvy and spasmophilia.

Additional and important insight into the pathogenesis of the disease under discussion has been obtained by the observations of Lust and Klocman[40] on the one hand and through those of Bahrdt and Edelstein[1] on the other. The former found in studying the metabolism of a marked case of scurvy in an infant that during the active stage of scurvy there was a retention of the minerals investigated by them, namely, calcium, phosphorus and chlorin, especially that of the calcium, and that during the convalescent period of the same case there was a negative balance produced by an excessive excretion of the same salts, and finally that in the stage of healing, while the total ash and phosphorus balances were positive, the calcium balance remained still negative This discovery by Lust and Klocman finds corroboration in the microscopic and roentgenologic study of scorbutic bones. As is well known, Hoffmann,[26] [40] Schmorl,[48] [34] and other pathologists have described the presence of an increase rather than a decrease of the preparatory zone of calcification. Hoffmann[40] [26] even speaks of a calcium congestion, and Fränkel,[9] [40] with the roentgen rays, first called attention to the presence of the more or less broad, white line at the junction of the epiphysis and diaphysis of the long bones, and showed that this line disappears extremely slowly and is, as a matter of fact, still present when otherwise from a clinical stand-point the child seems perfectly well.

Bahrdt and Edelstein,[1] however, in the chemical analysis of bones from a marked case of scurvy, made discoveries which at the first glance seem to contradict those of Lust and Klocman.[40] Instead of showing an increase in the calcium and phosphorus content of the bones, as one might have expected from the findings of Lust and Klocman, they found a distinct deficit in calcium and phosphorus of the bones and muscles, with an increase in the water-content and possibly also in that of sodium and potassium. They also believe that the sodium and potassium of the liver and kidney were somewhat decreased while the calcium content of these organs was normal if not above normal. These authors state that their findings would indicate that the kidney and the liver, on the one hand and the bones and muscle on the other, take opposite positions in the calcium metabolism. They are not so sure as to the application of this state-

ment to phosphorus, as it was found normal in all of the internal organs examined and also in the muscles.

Although the two findings of these two groups of authors seem to contradict each other, yet it seems to me perfectly possible that they do the opposite. The microscopic picture of scorbutic bones shows an increased deposition of calcium along the epiphyseal line but an increased porosity in the rest of the bone, especially in the diaphysis. This histological picture corresponds, as already stated above, with the roentgenologic, and I should think it perfectly plausible to assume that this condition is produced by a continuance of the normal function of bone resorption and a synchronous breaking-down of the normal function of bone development. That this latter in scurvy is not due to a deficiency in calcium is clearly proved by the miscrocopic picture and the roentgenological pictures which show an increase in the layer of calcification at Fränkel's line. In other words, while there is a certain amount of calcium being deposited at the part of the bone at which endochondral growth takes place under normal conditions, there is, nevertheless, in all probability not as much calcium in the whole bone at a certain advanced stage of scurvy as there would be in the normal, because in the first place the bone has ceased to grow either entirely[20] or at any rate not as markedly as under normal conditions, and in the second place the normal process of resorption is going on, producing a rarefaction and brittleness, with consequent loss of material. So it should be perfectly possible to find in the same child (1) an excess of calcium at the end of the bone in Fränkel's white line, (2) a reduction in the amount of calcium in the bone as a whole, such as Bahrdt and Edelstein found, and (3) a positive calcium balance, such as Lust and Klocman found, if but one thing happens, namely, that for some reason or other a holding down of calcium occurs in other parts of the body besides in parts of the bones. That there can be such a retention is indicated by the experience of Lust and Klocman, and even by the findings of Bahrdt and Edelstein themselves, who found a relative increase in the calcium content of the liver and kidney. An observation which I had occasion to make in a scorbutic child during June, 1916, also speaks in favor of a salt retention during the active stage of the disease. This child showed a marked difference between the water excretion by the kidney during the active and during the convalescent stages of the disease.

The chart below gives the details and shows that there was during the active stage a marked reduction in the amount of water excreted by the kidneys, which was not accompanied by a net increase in weight or by any significant change in the stools. Neither was there an influential change from the normal in the temperature chart, and the outside temperature was distinctly lower than it was during the stage when orange juice was given. The giving of orange juice markedly increased the urinary output

TABLE SHOWING URINE EXCRETION, ETC., DURING SCURVY.

Date, 1916.	Mean daily temperature.	Mean daily group, temperature.	Mean daily relative humidity.	Mean daily group, relative humidity.	Drugs.	Total fluid intake in 24 hours, including O. J. when given, c.c.	Average daily group intake, c.c.	Urinary output in twenty-four hours, c.c.	Average daily group urinary output, c.c.	Average daily urinary output, per cent.	Average daily group, urinary output, per cent.	Stools.	Body temperature.	Body weight grams.
June 22	60		61		None	1000		265		26.5		1 N	36.8–37.0–36.8	6570
23	64		56		"	720		65		9.0		1 E	36.9–36.8–37.1	6610
24	72		60		"	520		69		13.2		1 N, 1 sl. thin	37.4–38.2–37.2	6600
25	66		70		"	980		190		19.3		1 N, 1 sl. thin	36.8–37.1–36.8	6660
26	69	65.7	58	66.8	"	422	751.3	26	167.2	6.1	20.9	2 N	36.5–37.1–36.5	6590
27	65		83		"	740		145		19.5		1 N	37.0–37.2–37.0	6370
28	62		86		"	760		355		46.7		1 N, 1 choppy	37.0–37.4–37.0	6440
29	66		68		"	760		205		26.9		1 N	36.5–37.5–37.0	6480
30	68		60		"	860		185		21.5		1 N	36.6–37.4–37.4	6530
July 5	70	69.0	76	67.0	"	480	400.0	11	45.5	2.3	13.65	1 N	37.3–37.9–37.0	6350
6	68		58		"	320		80		25.0		2 N	37.3–37.8–37.5	6300
7	70		56		Pot. cit. 4x1 gm.	580		128		22.6		1 N	37.3–37.5–37.0	6260
8	72	70.5	72	69.0	"	620	580.0	88	149.7	14.1	26.35	2 N	37.5–38.0–37.4	6220
9	68		78		"	620		203		32.7		0	37.0–37.4–37.3	6250
10	72		70		"	500		180		36.0		2 choppy	37.3–38.3–37.5	6180
11–13	..		..		None	....		...		....		On the 11th:	37.3–38.8–38.8	6270
14	77		72		Na cit. 4x1 gm.	400		65		16.2		2 N	37.4–37.2–37.2	6260
15	81		64		"	470		200		42.5		0	37.7–37.7–37.3	6270
16	74		78		"	640		210		32.8		1 N	37.0–37.0–37.0	6220
17	75	77.2	86	79.2	"	440	542.8	175	168.5	39.7	31.4	2 N	36.8–37.3–37.3	6230
18	76		88		"	600		255		42.5		0	37.3–37.3–37.1	6090
19	80		77		"	530		160		30.1		1 choppy	37.3–37.2–37.1	6100
20	78		90		"	720		115		15.9		1 N	36.0–36.8–37.4	6160
21	76		68		Off. " On orange juice	?		420		....		.....	36.8———36.8	6120
22	74		54		O. J. 60 c.c.	520		245		47.1		1 N	36.8–37.4–37.9	6080
23	76		59		" 90 "	970		310		31.9		1 N	37.2–37.2–37.2	6060
24	77	77.0	56	61.1	" 90 "	960	835.0	345	320.0	35.9	40.15	1 N	37.2–37.3–37.3	6060
25	78		68		" 90 "	1030		335		32.5		1 N	38.3–37.5–37.0	6090
26	78		60		" 90 "	1020		415		40.6		1 N	36.9–37.1–37.0	6150
27	80		62		" 90 "	510		270		52.9		1 N	37.0–37.3–37.3	6250

from 20 per cent. of the intake to 40 per cent., even though at this time the outside temperature was distinctly higher (14.1° F.). And in the face of this increased urinary excretion the infant made a net gain in weight, showing, just as the general appearance of the infant did, that the body was again working in a more normal fashion. Surely the simplest interpretation that can be given to this observation of decreased water output by the kidneys is a retention of salts by the body, either as a protective measure or simply as a result of hindered salt excretion, and that the water was given off mainly by way of the lungs.

This finding seems especially significant in view of the fact, as can be seen from the chart, that the giving of potassium citrate had only a little effect upon the urinary excretion. The amount of urine passed within twenty-four hours, however, notwithstanding the increase in outside temperature, was somewhat more increased by the giving of large doses of sodium citrate, and both in this case and in another it was observed that there also was a distinct but temporary improvement in the general condition of the scorbutic child after the administration of this salt; so marked was this in the one instance that the gums became distinctly reduced and pale, only, however, to get worse again in the face of the continued administration of the drug. The general behavior of the child improved within twenty-four hours, the gums were pale and decidedly reduced after 3 x 24 hours, and after remaining so for an additional 2 x 24 hours became abruptly worse again without any change in the therapy having been instituted in the meantime.

This same decrease in urinary excretion in the water output by the kidneys seems to occur in guinea-pigs getting scurvy on a diet of oats and water, for frequently I find in my notes the observation recorded that the sawdust pens of these animals at about the second week of the disease were especially dry and clean, and since having made the above-described observation in the infant with scurvy I have had occasion to ask four mothers of scorbutic infants regarding this symptom, and they all state that the baby "did not wet nearly as much since it had been sick as it did when it was still well." If this observation is confirmed and found to be present in most cases of infantile scurvy it will represent an addition to the clinical symptomatology of scurvy.*

Very recently Bauman and Howard[2] in their study of the mineral metabolism of normal and scorbutic guinea-pigs, reported findings which are in contradiction to those reported by Lust and Klocman

* Since this article was presented, A. F. Hess (Infantile Scurvy: V. A Study of Its Pathogenesis, Am. Jour. Dis. Child., 1917, xiv, 337) has expressed the opinion that the increased pouring out of water by the kidneys after the administration of orange juice was due to a simple diuretic effect of the orange juice. However, from the experience obtained in this case with the administration of large doses of potassium citrate, which is the classical diuretic and much more effective than sodium citrate, it would hardly seem that Hess's interpretation were correct.

for their infant. They found, namely, that all of the elements, except magnesium and chlorine, showed a negative balance during the scurvy period.

There can be no question that clinical experience with infantile scurvy points strongly to the carbohydrate high foods, everything else being equal, as being the most prominent factors concerned in the production of the disease. As already stated, Funk[12] and Braddon and Cooper[3]—the latter for beriberi—believe that the greater the amount of carbohydrate content of the food the greater will be the amount of "vitamine" required to keep up a normal carbohydrate metabolism, and the sooner the body supply of "vitamines" will be exhausted, especially if by various means, principally by heating, the "vitamines" present in any food are made useless.

At the time when Braddon and Cooper's[37] article appeared I had occasion to see a thirteen-months-old infant in a state of malnutrition and ill with a distinct clinical scurvy. This infant had been fed on various kinds of foods since its second month, but during the three months previous to his coming to me he had received, according to the mother, nothing but raw milk diluted with water, together with enormous amounts of Mellin's Food (sixteen heaping tablespoons). I questioned the mother carefully as to the manner in which she had warmed the bottle and how she had prepared the milk, but could only come to the conclusion that she had not warmed the bottle differently than is desirable. This made me feel at the time that this infant represented a counterpart to Braddon and Cooper's pigeons, and I still think so.

In this connection the experiments of Mayer[42] and Hildebrandt[25] are very suggestive, as these authors were able to prove a breaking down in the oxidation process of sugar in animals after having administered excessive doses of carbohydrates. And what is more, they have proved that under these circumstances at least a certain part of the oxidation of glucose stops with the production of oxalic acid, an acid which, as is well known, has an enormous affinity for calcium and with it forms a salt that is soluble with great difficulty.

However, all of the symptoms produced by these authors and others, such as Chiari, Chiari and Fröhlich, and Januschke,[5 6 7 31] by binding calcium through the administration of oxalic acid could be prevented or, at any rate, modified and lessened by giving calcium in sufficiently large doses, an experience that has not been met with in cases of scurvy that have received calcium and cod-liver oil in seemingly adequate doses—Hess,[19] Ingier,[28] and H. J. G. (see page 257). And then, as Sedgwick has shown, newborn infants excrete within twenty-four hours a much larger amount of oxalic acid than do adults, and give evidence of no condition that can be compared with any of the known symptoms of scurvy.

So that while there are many clinical and experimental data that seem to speak strongly against the assumption that oxalic acid is

responsible for the defunctioning of calcium and its corresponding physiological anion, it has nevertheless seemed worth while to me to try to settle this question by resorting to every means possible to try to find oxalic acid present in cases of scurvy as a calcium fixer, because not only would its presence explain the production of the various symptoms described in the earlier part of the paper as a result of defunctioning calcium and its physiological anion in the bones, the vessels and the nervous system, etc., but also the rapid and marvelous disappearance of the symptoms just mentioned by the oxidation of oxalic acid in the presence of the physicochemical substance or "vitamine" necessary for normal and complete oxidation of carbohydrates and through its consequent primary release of calcium and its secondary release of other salts.

And it seems to me, in the face of the adverse experimental data mentioned above, as if, after all, oxalic acid could be responsible for the defunctioning of calcium and its physiological anion, if we assume that the production of the oxalic acid and its binding with calcium occurs within certain cells themselves, or in tissues that are poorly supplied with blood and lymph vessels, such as cartilage, both places where the solution of a salt like calcium oxalate would be distinctly less readily accomplished than, for instance, in the blood stream itself.

That the conditions for salt solubility in a given tissue system or, in other words, its fluid inflow and outflow, and the extensiveness of the system also may be a factor of decided importance in the production of the type and behavior of the different clinical, histological and chemical symptoms of scurvy, seems probable from a consideration of the location of the lesions in the vessels and in the bones.

It is certain that the most marked changes occur where bone growth is relatively greatest and where at the same time the blood supply is relatively smallest. So in the lower extremities the more severe lesions are located in the neighborhood of the knee, and in the upper extremity in the neighborhood of the wrists and shoulders, all parts of the extremities lying in the opposite direction of the nutrient artery. Then, the lesions limited to the vessels all clear up much more rapidly than those occurring in the bone, and in the bone again the lesions last to disappear are those in the region of Fränkel's white line, surely a part of the bone which has less blood-vessels than that near the periosteum, a fact that also can well explain why Fränkel's line persists much longer than any other one symptom of scurvy.

From the close dependence of the severity of the vessel lesion on its proximity to growing bone, one might believe that the substance which defunctionates calcium and its physiological anion is produced solely by the bone cells, the osteoblasts, and that the vessel lesions are produced by the vessel cells coming into contact

with this agent during its passage in the blood stream. But the published accounts of hyperesthetic cases such as were described by Lesage[33] and of cases showing hematuria as the only symptom, make it more probable that cells of different systems may not be able to entirely oxidize carbohydrates in a normal manner. It also may be possible that the hematuria may be produced as a result of a change in the chemical form of the attacking agent during its excretion by the kidneys, although this does not seem plausible for other reasons. So taken all in all it does seem as if various cells, some for hereditary and some for acquired reasons, first break down and more completely than other cells in the performance of their carbohydrate metabolism and consequently show clinically recognizable signs of scurvy, either alone or in advance of cells located elsewhere. That, however, all vessel lesions in their entirety are not due solely to the breakdown of the carbohydrate metabolism of their own cells, would seem to be true from the close connection existing between the severity of the bloodvessel lesions on the one hand and of their proximity to the bones on the other. This is most beautifully demonstrated by the lesions occurring in the gums only when the teeth are erupting or have erupted; in other words, at a time when the alveolar periosteum is very active and when the gums have become firmly attached at the neck of the tooth to the tooth and to the periosteum.

Also periosteal bone formation is a much more vascular process than endochondral bone formation is, and this further explains the presence of the greatest hemorrhagic lesions along the periosteum.

At the present moment, however, I do not find myself in a position definitely to state that oxalic acid is or is not the defunctioning agent responsible for the production of the clinical symptoms of scurvy, even though I have diligently and persistently tried to prove its presence for more than twelve months. However, I expect to be able to report within the very near future.

It may be that another substance may be responsible for the clinical symptoms of this disease, but if this is so then it seems to me as if it must have the same powers regarding the defunctioning of calcium and its physiological anion that oxalic acid has, and the same *modus operandi*.

It is also possible that the defunctioning of calcium and its physiological anion does not occur through the action of the kind of substance indicated above or within the cell, or solely within the cell, but that it occurs in the cell membrane, at least partly so, and there, *via* the same or another *modus operandi*, affects the cell permeability in a manner as suggested by the interesting and important experiments of Jacques Loeb.[35 36 37 38] The observation made in the two scorbutic infants after the administration of sodium citrate might be interpreted in this manner.

Observations made by me in experimental work with a scorbutic infant and with pigeons ill with polyneuritis* make me feel that in all probability we shall find that the defunctioning agent is produced as a result of a broken-down carbohydrate metabolism due to a disproportionment within the cells between the carbohydrate supply on the one hand and the physicochemical substance, the so-called "vitamine," growth factor or known substance on the other.

These observations have shown that there is an immediate, distinct and marvelous change produced in the pigeons ill with polyneuritis by the administration of yeast, and in the scorbutic child by the administration of orange juice in the respiratory quotient† that can only be interpreted as indicating an immediate and marked rearrangement and readjustment in some known or unknown oxidative process of the body.

This observation is an added argument against the assumption of McCollum and Pitz,[44] that scurvy is produced in guinea-pigs as a result of constipation. Before any orange juice can possibly get down to the large intestines a definite and distinct change can be registered by the respiratory apparatus. And then constipation is not a part of the clinical picture of scurvy, as it does not occur with any kind of regularity or frequency in scorbutic infants, and the large intestine of my scorbutic guinea-pigs on oat-and-water diets have off and on been practically empty at necropsy.

The remarks regarding the observations obtained by studying the respiratory quotient in the scorbutic infant and in polyneuritic pigeons are also to be considered as having been made in the sense of a preliminary statement.

RÉSUMÉ. 1. An hypothesis is offered regarding the pathogenesis of infantile scurvy.

2. The hypothesis is divided into four separate parts, of which only the first is considered to be sufficiently based on experimental and clinical data to permit its exit out of the domain of pure hypothesis.

The second and third, the latter of which has been similarly and previously advanced by other authors, are considered to have as a basis experimental and clinical data that are distinctly suggestive, while the fourth is still purely hypothetical, although on its assumption it is possible to explain satisfactorily some of the clinical phenomena of scurvy that hitherto have had not even an hypothetical explanation.

* Very suggestive data can be found in the work reported by MacArthur and Jones (Some Factors Influencing the Respiration of Ground Nervous Tissue, Jour. Biol. Chem., 1917, xxxii, 271), who studied the respiratory quotient of different parts of the central nervous system and found that the respiratory quotient is higher in white matter than in gray, and higher in the peripheral nerves than in the other portions of the nervous system.

† Ibid.

3. A report is made of a case of infantile scurvy which showed a marked reduction in the water output of the body through the kidneys without the presence of the usual and known causes for water loss *via* other channels, and which further showed a marked change toward a return to normal conditions by the administration of orange juice, indicating a protective salt retention or hindered salt excretion as the cause of the transfer of a good portion of the water excretion from the kidneys to the lungs.

The same condition seemingly was present in 4 additional cases of infantile scurvy as well as in scorbutic guinea-pigs on an oat-and-water diet.

It is suggested that the phenomenon observed is a part of the regular picture of infantile scurvy and represents an addition to the clinical symptomatology of scurvy.

4. A case of infantile scurvy is reported as being a counterpart to Braddon and Cooper's polyneuritic pigeons by having developed its symptoms on a diet of raw milk, modified, however, by dilution with water to one-half and by the addition of enormous amounts of carbohydrates in the form of Mellin's Food.

5. The experience of other authors regarding the inefficiency of cod-liver therapy and calcium therapy in scurvy is corroborated by absolutely negative therapeutic results having been obtained in a case of infantile scurvy upon the administration of tricalcium phosphate and cod-liver oil, indicating that a deficiency of calcium in the diet or in the body plays no primary role in the development of scurvy.

6. A report is made of a distinct but temporary improvement in the clinical picture of 2 cases of infantile scurvy upon the administration of large doses of sodium citrate. This observation suggests the possibility of the existence in the development of the clinical picture of infantile scurvy of a *modus operandi* similar to such as has been shown to exist in cell permeability and irritability by the researches of Jacques Loeb.

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WAR MEDICINE

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THE WORK OF THE CHILDREN'S BUREAU, DEPARTMENT OF CIVIL AFFAIRS, AMERICAN RED CROSS, FRANCE.

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I.—THE SITUATION IN AUGUST, 1917.

THE children's situation in France as we found it on our arrival in August was somewhat as follows:

France had been at war for three years. Practically all her men of fighting age were at the front occupied in some branch of

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the Army or in the work of providing for the Army, so that most of the institutions which had been built up in times of peace for the care of children had suffered materially. Indeed, French children, as a whole, had not had the attention they received before the war. This condition is only too evident to one who makes a close survey of the situation, and the reasons for it are patent.

Here, as in Belgium, the main efforts for child welfare have been those dealing with infancy, so that where we did find any work established for children in France it was designed to increase the amount of nursing and care given to young infants. This work cannot be overestimated. It is the foundation stone; but the older child, especially the adolescent child, had received comparatively little attention. Under the circumstances this is almost inevitable. But here, as in Belgium, the absolute necessity of bridging such a gap was apparent if the efforts in behalf of the infants were to bear lasting fruit.

French children, as a mass, are underfed, undernourished and insufficiently clothed, especially those whose parents have been unable to provide for them out of means accumulated before the war. Probably at no time in the history of the world has there been such a widespread condition of underfeeding and poor nutrition as now exists in a very large proportion of French children.

Owing largely to the almost static condition of the civilian population there have been very few widespread epidemics: dangers of such epidemics increase with the moving about of refugees. If a widespread epidemic should occur at the present time I believe that the mortality would be very high, for the children have undoubtedly less power of resistance than they have ever had before. The infant mortality rates rose during the first year of the war, fell sharply during the second year, and began to rise again during the third year. There has been a very widespread increase in syphilis and venereal disease as a whole. In conjunction with certain economic causes these diseases have produced an increase in prematurity and in miscarriages.

Other social conditions exist, such as marked increase in juvenile delinquency and child labor, which have a direct relation to the health conditions among the children. These conditions, however, have such widespread economic significance that they must be treated separately. Here they are mentioned only in their relation to the health conditions. But it can be said of this situation here, as at home, that the breaking down of the normal individual home has an almost immediate effect upon the health conditions. These statements apply in varying degrees to most of the children of France. The task of social and medical effort which they present is enormous.

These general health conditions in France present some of the

gravest problems among the civilian population, and the Children's Bureau whose chief aim was medical care and conservation of the children, naturally took its place in the department of Civil Affairs of the American Red Cross. This Department, under Mr. Homer Folks, consists of a number of bureaus dealing with different civilian problems, such as Rehabilitation, Reconstruction, Housing of Refugees, Tuberculosis, and Children's Medical Work. The Children's Bureau immediately felt that not only was the closest coöperation with the French medical men and the French Government essential, but also that the closest coöperation between the different bureaus was absolutely necessary to meet the present health problem. From the first the Tuberculosis Bureau of the Red Cross, the Rockefeller Commission under Dr. Livingston Farrand and the Children's Bureau have worked in closest harmony. The medical problems, along general as well as special lines, as they appear in all bureaus dealing with the civil population in France, demanded, for effective work, the organization of a central medical committee. This committee, resulting as it has from the natural outgrowth of conditions, is able to simplify and unify the medical work among civilians. It was quite possible to be a tuberculous refugee child, sick with scarlet fever, and find the issue quite confused by the fact that three bureaus dealt with you. The present central medical committee, composed of (1) Dr. Miller, as chairman, representing the Rockefeller Commission, (2) Dr. White, Chief of the Tuberculosis Bureau, Red Cross, (3) Dr. Lucas, Chief of the Children's Bureau, Red Cross, (4) Dr. J. H. Mason Knox, Associate Chief of the Children's Bureau, and (5) Dr. Richard Cabot, of the Bureau of Refugees, strengthens and regularizes a coöperative interchange of medical aid which broadens and deepens the medical service which the American Red Cross can render the French in this hour of their great need. Civilian relief in France is largely a health problem, and it is along health lines that the approach is most quickly and tactfully made. The sympathetic understanding of this point of view by Mr. Homer Folks, the Director of the Department of Civil Affairs, is rendering the work of this Medical Committee more effective, and in all our public health undertakings the big, sane vision of Dr. Livingston Farrand, head of the Rockefeller Commission, is a constant source of help and inspiration.

II.—WORK IN THE "ZONE DES ARMEES."

The most urgent need which faced us at the outset in August was that of the children from devastated areas in what is known as the "Zone des Armees," an area extending back for about thirty

miles from the front lines of the army. In this area we found towns which are likely to be bombed at any time, other towns partly destroyed, which had been evacuated early this year, and still others which were then being gassed, or were under continual shell fire. From this area the children are constantly being sent back in varying numbers; sometimes they are moved for short periods only during acute bombardment. At other times when the sector is suffering from more or less constant shell-fire or gas attacks the children have been evacuated more permanently. Here the problem is an urgent one. We have attempted to meet it in several towns which seemed to demand immediate attention and from which calls had already come to the Red Cross.

The largest undertaking of this kind has been in the Meurthe-et-Moselle Department under the kind guidance and auspices of Prefect Mirman. At his invitation the Red Cross has established a large clearing house and hospital at Toul. Here some 450 children and 50 mothers from gassed or bombed villages are housed and medically supervised. A women's and children's hospital for the whole Meurthe-et-Moselle Department has been started here, and its equipment largely given by the American Fund for French Wounded. Dr. Julius Parker Sedgwick, professor of pediatrics of the University of Minnesota, was the first director of this work in the Meurthe-et-Moselle, and it is due to his untiring patience and strength that the first three months of difficult pioneer work were brought to a successful establishment of the beginnings of what promises to be of such great service to the whole district. Dr. Sedgwick was most ably assisted by Dr. J. O. Durand, of Seattle, Oregon; Dr. N. O. Pearce, of Minneapolis, was also associated with the work at Toul. Upon the return of these doctors early in December to their university work at home, Dr. Maynard Ladd, of the pediatric faculty of Harvard University, assisted by Dr. Karlton Percy and Dr. Robert Sharp, also of the Harvard medical faculty, was appointed director of the Children's Work in the Meurthe-et-Moselle. Dr. Ladd is devoting himself to the further development of new centers in the district on the same plan as Toul. Prefect Mirman gives always his most splendid help and coöperation; indeed, his vision for the people of his department and his wise plans for them are a constant source of inspiration and strength to the American workers.

From the Hospital at Toul a biweekly dispensary service has been established in the factories and mairies of six nearby towns. This service is covered by Dr. Alice Barlow Brown, of Chicago, one of the American Fund for French Wounded medical delegates assigned by the bureau to the work in the Meurthe-et-Moselle under Dr. Ladd. This fund has worked hand-in-hand with the Red Cross for the realization of the great opportunities for service.

At these dispensaries groups of children and women ranging from a few hundreds in one town to over 1000 in another are cared for medically. This work is very urgent and impelling; to a certain extent the workers are in constant danger, since they are well within range of air raids or of the enemy's guns.

In this area the need is not only for the care of children but also for the care of women, and although the efforts of the Chil-

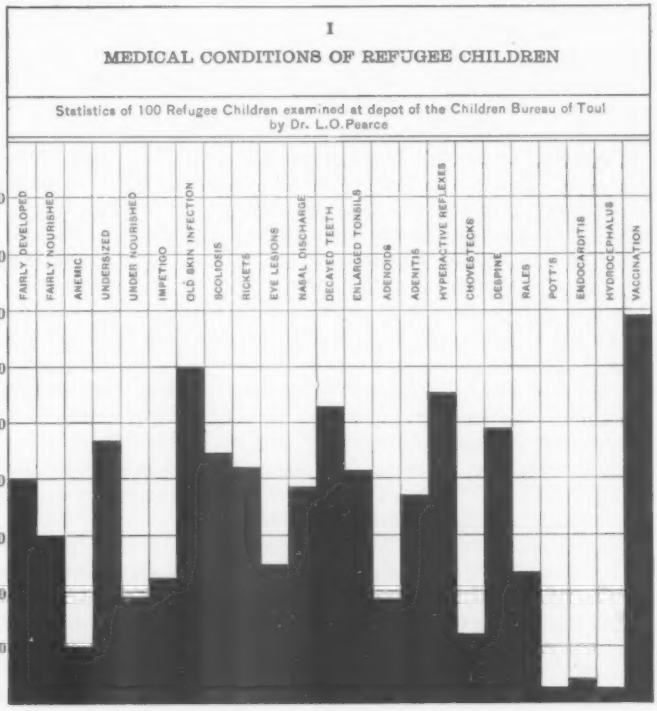

CHART I.—Chart of first 100 children examined at the hospital by Dr. N. O. Pearce.

dren's Bureau were planned at first wholly for the care of children, until the organization of the central Medical Committee, many adults had to be cared for. We have now at this station one physician specially trained for the care of women, so that obstetrical and gynecological cases will be admitted. In our dispensary work general medical diseases in adults had to be taken care of as the need arose, for it must be understood that most of the civilian population in the Zone des Armees has to rely for medial care

upon the doctors of the French military stations. Yet the physicians in these stations cannot always care for the civilian population adequately because the military exigencies of their own districts often demand their whole time for a long period. At these times the civil population must suffer. Hence we soon felt the need for a coöperation in our small health centers for children to include the care of the adult civilian population, and this need is now making itself felt more and more strongly throughout the Zone des Armees.

We have started another and smaller station with one doctor, two nurses, and an aid in a sector evacuated last spring by the Germans. Here we have organized a small hospital and a traveling dispensary to visit the small villages which have been devastated by the retreating Germany army, and are now being gradually reoccupied by their former inhabitants. Here the problems are manifold. The civilian population, as a whole, is helping to rebuild the houses; to reëstablish workers in their trade, and to build up normal life in the devastated villages. The Children's Bureau is helping to solve the medical problem. This hard, rough, pioneer work has been done by Dr. John C. Baldwin, of Johns Hopkins University, with two nurses and an aide. To establish the little ten-bed hospital in a town full of ruined buildings meant days of scrubbing, cleaning, trucking, carrying of water and coal, the hardest kind of physical labor under most difficult living conditions. Patience, tact, kindness, coöperation, every human resource was brought into full play, and when the little wards were ready for the first cases of sick children the doctor wrote in his weekly report: "The need is so great, the people are so thankful, this first little child is worth the whole effort."

The need for such medical stations for the civilian population in the Zone des Armees is pressing and immediate. To meet it a number of American doctors, both men and women, have already responded to our call. Before very long we expect to have a competent working force sufficient to meet the greatest needs as they arise. In many cases we hope to establish small stations, with one doctor and perhaps two or three nurses; in other places larger stations may be developed. But it is very difficult, while military operations are going on at the present rate, to form any definite program. The Children's Bureau will try to meet each situation as it arises.

III.—WORK FOR THE "RAPATRIÉS."

Another task which faced the Children's Bureau on its arrival in France was that of caring for the "rapatriés" as they enter France through Switzerland. At the present time the station of

entry is on the Lake of Geneva, in the small town of Evian, which has less than 5000 inhabitants. Into this town 1500 rapatriés pour each day, 750 in the morning and 750 at night. The proportion of children among them is from 40 to 60 per cent. of the whole number, so we have the task of caring for from 600 to 900 children a day. The largest number of children in any one convoy so far has been 680 Belgian children returning after three years of German subjugation. Anyone who saw these children, their emaciated, pitiful bodies, would realize how great a task confronted us at that point. It has been most difficult to secure adequate medical inspection of these children who came in by hundreds each day and were scattered throughout France the next day. If one visualizes this situation it is clear that the newly arrived children must be sent out of the city each day if the next 1500 rapatriés are to be cared for on the following day. The French needed and asked for help, with this problem, from the Children's Bureau.

We have now established a system for the rapid inspection of every child so that we can weed out those who appear diseased and put them aside for a more careful medical examination. We have also established a hospital, accommodating from 80 to 100 children. Our staff of doctors there is now adequate. Dr. Edmund J. Labbe, of Portland, Oregon, is the chief of the hospital, with Dr. Clain F. Gelston, of the University of California, as first assistant. The dispensary examines on an average 2600 children per week. The hospital is always full. The contagious villa has been full from the start, cases of diphtheria, scarlet fever and measles coming in every convoy.

We have before us, at Evian, one of the most interesting problems in public health that has ever been presented in the field of children's medical and welfare work. It is like the medical problem of Ellis Island on a large scale, although, in other ways, it has no such parallel because these "rapatriés" are French people returning to free France from captive towns. The Germans are returning them to France simply to avoid caring for those of the civil population unfit to work in field, factory or trench, and that means largely old people and little children. We are dealing with children, but we also face the needs of adults, which the Children's Bureau does not attempt to meet. We are preventing the entrance of infectious diseases; we are weeding out the children suffering from chronic diseases, mostly tuberculosis; we are placing the underfed and undernourished but otherwise healthy children in convalescent homes, where they can be cared for, for periods long enough to bring their vitality up to a point somewhere near par before they are distributed into various parts of France, where they will be forced to remain until the war ends, or until their home towns are reconquered by the Allied Armies. Thanks to the present

situation there is some hope that this will be accomplished more rapidly than at any time during the past three years.

I have already said that in our care for the "rapatriés" it has been necessary to establish convalescent hospitals in addition to the Evian clearing-house hospital for acute patients. The needs of convalescents are now being fulfilled at Lyon. Through the generosity of the Directors of the Lyon City Hospital we have been able to use a gift which has just come to them, a large chateau, with about 100 acres, on very high and attractive land, situated a short distance from Lyon. There we have established a convales-

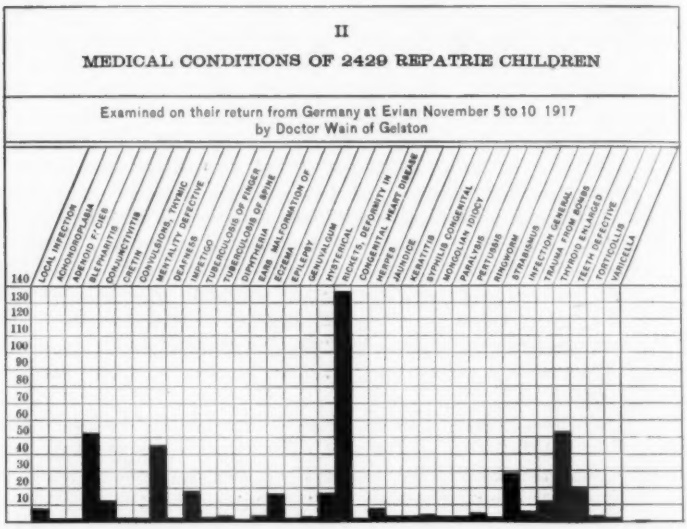

CHART II —Chart showing physical condition of the first 2500 children examined at the Dispensary by Dr. Clain F. Gelston.

cent home for 150 to 200 children, who are cared for until they are well enough to be sent on to join their families elsewhere in France. In connection with this hospital we expect to establish small institutions for special groups of cases, particularly for tuberculosis.

What other special needs will arise in connection with this work we cannot tell at the present time, as we have not been able to study the problem long enough to know all of its complexities. But that we must establish several smaller hospitals seems at the present time very clear.

The third "rapatrié" problem which the Children's Bureau is trying to solve concerns the medical care of the "rapatriés" already

distributed throughout France. Of these there are at present about 800,000, gathered in larger or smaller groups, sometimes as many as 10,000 in one place. In such centers we are building up health clinics in conjunction with the Department of the Red Cross dealing with the problem of medical relief for all refugees under Dr. Richard Cabot. Here, as in the Zone des Armees, the tasks are those of general medicine, although the greatest needs are those of the children and the women. There is very little obstetric work, because of the total absence of men under fifty years. These groups of refugees are composed mostly of old people, a moderate number of women in the child-bearing period, many children between three and fourteen years, but very few children above or below these ages. In these centers for refugees our work is one of careful medical examination, leading to the selection of those most in need of medical attention.

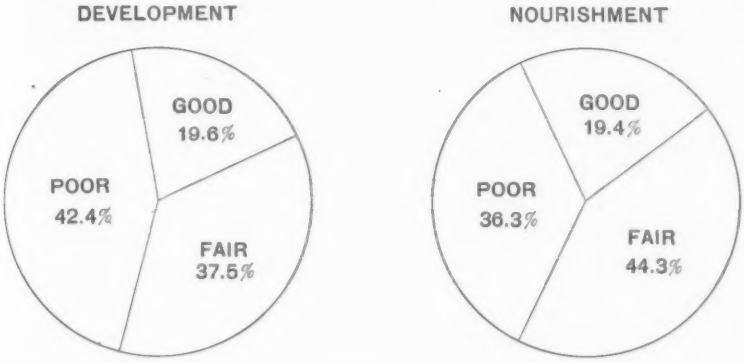

CHART III

IV.—DISPENSARY SERVICE.

The fourth demand that the Children's Bureau is attempting to meet is in the dispensary situation in Paris. At each dispensary established by the Rockefeller Commission for Tuberculosis, under Dr. James Miller of New York, the Children's Bureau is coöperating in developing a Children's Department. At present two such centers are started, and Dr. John Manning, of Seattle, is in charge of the bureau's work in these two dispensaries.

Two dispensaries for general children's work have been established by the bureau in two of the most crowded sections of Paris. These have been started at the request of French physicians, who find the pressure tremendous. The city hospitals in these districts are

overcrowded and understaffed, and men like Dr. Marfan, of the Infant Malade Hospital, and Dr. Guinon, of the Bretonneau Hos-

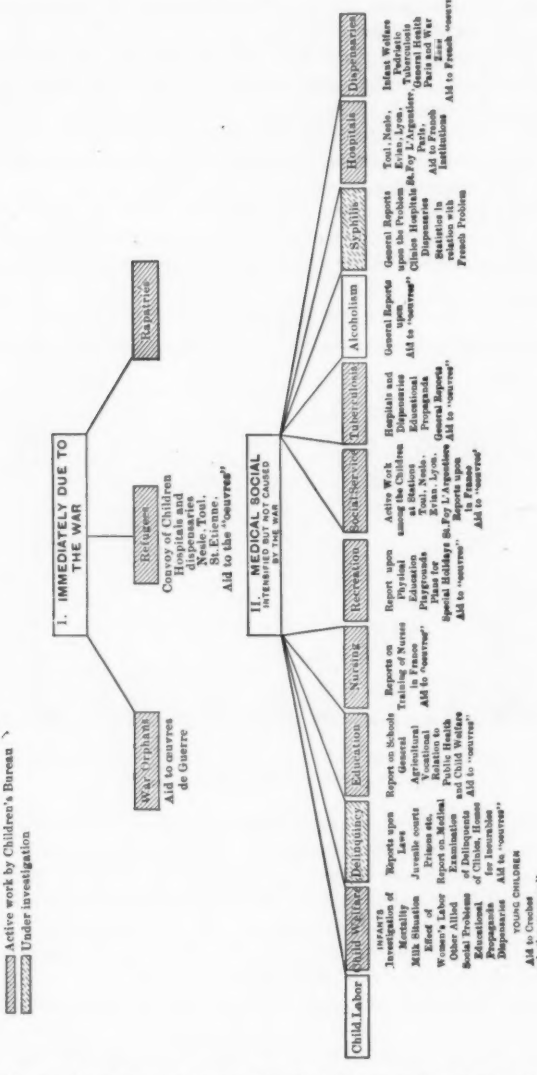

CHART IV.

pital, have been most eager for the help and coöperation of the Children's Bureau.

The plan now under way is to establish a clearing-house hospital and dispensary for children here in Paris. Hundreds of refugee children come from the north of France through Paris and a place of observation and of care for these children is greatly needed. This has been felt by all the different agencies, both French and American, dealing with the present acute problem of the refugee child. Again, the size of the problem seems almost overwhelming, but it is only by meeting one need at a time as thoroughly as possible that the service can be given. It is the hope of the Children's Bureau to have the Paris Clearing-house Hospital and Dispensary established and ready for work in another month.

I have already spoken of the assistance, medically, that the bureau is glad to give to French appeals for help. Besides the two dispensary services, one at Levallois-Perret and one at Grenelle, referred to in connection with Dr. Marfan and Dr. Guinon, the Children's Bureau has supplied a doctor for the Franco-American Committee for the Protection of the Children of the Frontier in the splendid work they are doing among about 1600 children. Two doctors of the Children's Bureau have been assigned to Italy for the immediate relief work there. One of our women doctors has been loaned to the work of the English and American Friends in a hospital for women and children which they are running in the War Zone.

V.—TUBERCULOSIS, EDUCATION, PUBLIC HEALTH.

Much the largest medical problem confronting France today is tuberculosis. In view of this, dispensaries for the care of the tuberculous are being organized by the Red Cross Bureau of Tuberculosis in conjunction with the Children's Bureau, which is starting work for infants and children in all the tuberculosis dispensaries to which I have already referred. The preventive side of this work for children is one of the most important tasks of the Children's Bureau. If we are to prevent the spread of tuberculosis we must teach the children and their parents such habits as will tend to prevent the dissemination of infection. This purpose can be accomplished by means of education in hygiene and public health, by developing community coöperation in health matters and building up the methods by which tuberculosis or any other infection can be checked in the home. For this purpose the Rockefeller Commission and the Children's Bureau are equipping a Bureau of Public Health Exhibits. These exhibits are modeled after the best types of American Child Welfare Work, most carefully and thoroughly adapted in form for presentation to the French mind. These exhibits include traveling exhibits on large motor trucks, carrying models, photographs, moving pictures and literature. The first week in December this exhibit makes its first trip, the way

being carefully prepared by an advance agent. This educational service of the Children's Bureau is in the hands of Mr. Philip S. Platt, and I feel that it is very close, in its importance to the French, to the immediate medical care. The work has been most carefully done. The Ministries of Munitions, of Education, of Labor and of the Interior are all in most hearty sympathy and coöperation. The League against Infant Mortality, the Lannelongue Institute of Social Hygiene, the National Labor Syndicate, the National Tuberculosis Committee, the Department of Health, the Museum of Hygiene and many private individuals, doctors and lay people have been consulted and all the material both of lectures, books, posters and leaflets has been made as thoroughly French as possible.

Already the attempt to fight tuberculosis by these means has been started in one of the smaller cities of France, at Bourg en Bresse, where, in October, an exhibit has been carried on with lectures and moving pictures and the other well-known features of a public health exhibit focussed especially on the problems of tuberculosis and child welfare. It is most encouraging to see this type of work developing in France, and we are sure of some lasting effect from such an educational campaign, because the French doctors and workers know its value and only need our help in getting such education to the people.

French workers prominent in the field of public health believe that one of the greatest needs of the time is for public health visiting nurses. Accordingly the Rockefeller Commission and the Children's Bureau, the Tuberculosis Bureau and the Bureau of Refugees, with Dr. Richard Cabot as Medical Head, are aiding in the development of visiting nursing in connection with the French training schools for nurses. Courses in visiting nursing and social service work will be given in connection with all the dispensaries, with special reference to tuberculosis and infant welfare. Lectures will be given; home visiting and follow-up work will be organized, together with an opportunity for experience in some of the French hospitals now maintained almost entirely by American nurses and American doctors. In this work the Children's Bureau is fortunate in having the assistance of Miss Elizabeth Ashe, whose sane and broad leadership in matters of public health and social service has distinguished her for twenty years in San Francisco, and Miss Harriet Leete, who has helped to develop in Cleveland what is probably the best of all nursing centers for child welfare. We hope to make a demonstration of permanent value. Indeed, of all the lines of work in which the Children's Bureau is engaged its public health nursing and the Model Health Center in which we shall have a large share, will be the most permanent and lasting.

Under Miss Maude Cleveland, of the faculty of the University of California, a splendid program of recreation for all our different

children's centers has been worked out, and Miss Cleveland is devoting all her trained skill to the problem of play for these tired and frightened French children. In our hospitals and convalescent homes, trained recreational workers are lightening the problems by adding to the normal happiness of each child in helping them to play.

Another large section of the Children's Bureau is given to the question of aid to other societies doing medical and welfare work for children. We are here to help the French in the way they want to be helped so far as it is possible, and the bureau has had over 200 applications for help from different societies and institutions for the care of children who are suffering from war conditions. In this section the bureau has the assistance of Mrs. William H. Hill, Secretary of the Franco-American Committee for the Protection of the Children of the Frontier. Mrs. Hill's long experience in France and sympathetic knowledge and understanding of the different works being carried on for children make her invaluable to the bureau in the difficult task of investigating and selecting the works we are able to assist.

The efforts of the Children's Bureau, then, are already numerous. The type of medical assistance that we need is general rather than special, except in its model health center, where only specialists will be needed. Elsewhere in its work with the "rapatriés" and in the Zone des Armees we need physicians and nurses with general training rather than specialists.

Perhaps the most lasting work which the Children's Bureau will accomplish will follow the work now in progress in its coöperation with the National League against Infant Mortality. The chief and the associate chief of the Children's Bureau, Dr. W. P. Lucas and Dr. J. H. Mason Knox, are attending weekly committee meetings of La Ligue contre La Mortalite Infantile, and coöperating in every way with plans under development for a national campaign against infant mortality. The child life of a country is the second line of defence. It must be preserved at any cost and strengthened in every way if we would keep any nation truly prepared to meet future demands. The conservation of child life is as much a part of this great conflict as the maintinance of armies. It is for the future freedom of the children of today and of tomorrow that our Allied Armies struggle at present. The struggle must not be in vain. From such ideals at home the Children's Bureau[2] of the American Red Cross sprang. Toward the consummation of such ideals the Children's Bureau will continue to work.

[2] The present (December 1, 1917) staff of the Children's Bureau numbers 37 doctors, 41 nurses, 14 aides, 12 social service, educational and recreational workers, and 12 clerical and business staff, total, 116.

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War Neuroses.—MacCurdy (*Psychiatric Bulletin of the New York State Hospitals*, July, 1917) says although the term "shell-shock" has been adopted officially by the British War Office, as the diagnostic term to cover all neuroses arising among officers and soldiers of the armies, the name "war neuroses" is considered more advisable by the writer. In a little over 100 pages he gives a comprehensive survey of these conditions, with detailed reports of 27 cases. These were observed in British hospitals during a period of two months, and in their number were both officers and men. The two main types of war neuroses are conditions of anxiety on the one hand and of simple conversion hysteria on the other. The former may also be designated as anxiety states, for anxiety is the most prominent and consistent feature in the clinical picture. These cases bear most resemblance to what is frequently termed "neurasthenia" in civil practice. The first sign of an approaching neurosis is fatigue. This is not ordinary fatigue, which is completely removed by rest, even of quite brief duration. The conditions producing the fatigue are both physical and mental. Those on the physical side are the obvious ones of long hours of duty, combined often with irregularity of meals, shortness of water supply, exposure to extremes of temperature, and to frequent storms. Important as these are, however, they are probably of less influence in the production of neurotic fatigue than are the purely mental influences. The most common and important of these is the strain of continuing in a dull routine that demands a constant alertness, a speediness of decision, complete self-confidence, and a spontaneous eagerness; and this mental attitude must be maintained for hours at a time, even days, without sleep, often without the distraction of food, and in the face of constant danger. Other factors contributing to the development of fatigue are personal antagonism to an associate, susceptibility to particular discomforts, such as presence of vermin or bad odors, particularly of unburied bodies. It is a striking fact that anxiety conditions in a pure state occur almost exclusively among officers, and this may well be because of their greater responsibilities in the mental sphere. It is their task not merely to keep their own feelings in subjugation but to inspire the men beneath them with courage and enthusiasm. The various stages in the progress of the conditions are followed out in detail by the author, with illustrative cases. The role of concussion in the production of anxiety states has been emphasized by the more organically-minded neurologists. But in this series of cases, less than a fourth showed concussion as a preponderating factor. Two-thirds had no suggestion whatever of concussion in their history. Attempts should be made by neurologists to discriminate between the symptoms which are to be accounted for on a physical basis and those more purely psychological in origin. The treatment of the anxiety states is effective in a large number of cases, and some of the guiding points are here outlined. The conversion hysterias are much simpler in mechanism than the anxiety states, and it is less difficult to understand them and to treat them. Conversion neuroses may be defined as neuroses in which there is an alteration or dissociation of consciousness regarding some physical function. The term is used because an idea is transferred over into a physical symptom. The cases are confined almost entirely to privates and non-commissioned officers, and the more important symptoms

are those which obviously provide the patient with a relief from active service. Mutism is the commonest, possibly, and deafness is fairly frequent, and next in importance are motor disturbances. Fatigue is usually the first symptom discoverable, but it is not often so severe as in the anxiety cases and its effects are not so well marked. More frequently there is a history of pure diurnal dissatisfaction. There is almost always some weariness and a distinct antagonism to fighting. This attitude of antagonism with some idea of release constitutes the background of the hysteria. Various types of treatment are in common use. Any form of suggestion, particularly hypnotism, is often effective in the removal of the immediate symptoms. Drawbacks to this method and indications for other lines of treatment are discussed. Under the heading of heart neuroses are considered briefly that condition which has been termed "soldier's heart" or "disordered action of the heart." This is found in a rather large group of men who are invalided from the trenches with heart symptoms but who show no signs of valvular trouble. The cardinal symptoms are weakness, shortness of breath, palpitation, and dizziness. Some think the condition a form of war anxiety neurosis. The patients examined by the writer were not neurotics in the narrow sense of the word. These war neuroses are apparently a corollary of modern methods of fighting. There is something in the modern trench warfare, combined with the appalling artillery fire, which tends to produce a condition of what might loosely be termed neuropsychic instability. In the Boer war nothing similar was observed, and the first reports of these conditions came from the Russo-Japanese war. W. H. F. A.

Infective Jaundice.—Dawson, Hume, Bedson (*British Med. Jour.*, September 15, 1917) state epidemics of jaundice have been of frequent occurrence among armies in the field. Early in this war the authors began to observe severe cases of jaundice in which there were high fever, hemorrhages, enlargement of the liver, and a tendency to febrile relapses, which in no way conformed to the typhoid group. During the same period, Japanese investigators, Inada and Ido, and their co-workers had found by animal experimentation that cases of febrile icterus in Japan were caused by a specific organism which they named Spirocheta icterohemorrhagiæ. This is described in two recent papers in the *Journal of Experimental Medicine*, 1916. Following the line of investigation suggested by this discovery, the present authors have been able to prove that the infectious disease usually accompanied by jaundice which they had been studying among the French and British troops in France is also due to this spirochete. In a case of moderate severity the following features are noteworthy: Sudden onset, vomiting with high fever, marked prostration, occurrence of melena and hemoptysis, hemorrhagic herpes on the lips, appearance of jaundice on the fourth or fifth day which increases up to tenth or twelfth day, fall of temperature at the end of eleven days and the finding of typical spirochetes in the urine after ten to fourteen days. The urine usually contains a large quantity of bile, and albumin can nearly always be detected. The liver is usually considerably enlarged but the spleen is practically unchanged. The mortality is estimated at 4 to 5 per cent. Their treatment thus far has been purely symptomatic. The

jaundice appears to be due to obstruction, and not of hemolytic origin. The mode of excretion as studied in the guinea-pig by the Japanese workers is by the bile, feces and urine, but it is only in the latter that it can be demonstrated readily under the microscope. Infection may take place through the skin, or by the mouth, and the infective organism is probably spread mostly by the urine and feces. It has been noticed that the majority of cases come from localized portions of the front-line trenches, and that these trenches were always damp or wet, because it was impossible to drain them properly. When troops were moved out of these trenches, they ceased to have cases of jaundice, and when fresh units were brought in, although there were no cases among them before, the disease soon developed. In addition to the patients themselves distributing the organisms, it has been found by the Japanese investigators that 38 per cent. of the field rats coming from the areas to which jaundice was epidemic showed the presence of the spirochete. So that in the trenches the omnipressent rat may also act as a carrying agent and spread the disease by means of its urine directly or indirectly. Early diagnosis by finding the organism is not easily possible. Up to the seventh day it may be looked for directly in the blood with dark-ground illumination but it is difficult to locate owing to the small number of organisms present. The spirochete does not appear in the urine until about the ninth day and then only in very small numbers, but the number increases rapidly and reaches the maximum at about the thirteenth to fifteenth day of the disease. The most satisfactory diagnostic test is by injection of the patient's blood or urine into the guinea-pig. In a positive case after an incubation period of six to twelve days, the animal develops the disease and dies. On account of the time required by this test—the most decisive of all—the main reliance in diagnosis has to be placed on the correct interpretation of the clinical signs and symptoms. W. H. F. A.

Epidemiological Study of an Outbreak of Measles.—Lieut.-Col. Edward L. Munson, M. C., U. S. A. (*Military Surgeon*, xl, 666; xli, 63, 186, 257), gives the results of a study of an outbreak of 444 cases of measles among 13,773 troops. He calls attention to the sanitary importance of measles among troops. It is his belief that the disease should be classed among the respiratory diseases instead of among the eruptive fevers, and is of the opinion that an epidemic of respiratory diseases should be regarded as a warning of an outbreak of measles. The exciting cause is believed to be a vegetable organism on account of the variable period of incubation, irregularity being characteristic of the development of vegetable rather than of animal life, and because it is more or less alike in its requirements for perpetuation and development to the exciting causes of other respiratory diseases of bacterial nature. The duration of the infectivity of the disease is that of the catarrhal stage. This undoubtedly varies and the length with few exceptions seems almost impossible to determine. Many cases were preceded by "coughs" and "colds" of obscure origin and when one clinical condition merged into another often is not possible to say, indeed rapid rise in the respiratory sick rate should serve as a warning that an outbreak of measles is impending. It is believed that the

period of infectivity comes at least three days before the rash appears. The apparent incubation period was thirteen to fourteen days, the wide variation given in some text-books being never observed. Of the contributory causes, the environment in the tent is believed to have been the most important. Cold weather brought about the use of stoves and led to poor ventilation, with the result that the respiratory sick rates increased promptly and extensively. There is no direct effect of the weather on the cause of the disease, but it acts indirectly through the mode of life of the individual. Spitting was probably a fruitful way of transmitting measles. There is reason to believe that virulence, size of dose, and repetitions or duration of exposure have much to do with susceptibility or immunity. This is merely an hypothesis at present but clinical experience is in favor of it. M. J. R.

Effect of Marching on the Rates for Non-efficiency of Newly Raised Troops.—Lieut.-Col. Edward L. Munson, M. C., U. S. A. (*Military Surgeon*, xl, 171), states that the amount of disability in a marching command is an expression of the care with which the troops were selected, the efficiency of their training and the thoroughness with which unfits were eliminated prior to the beginning of a march. When these factors did not obtain in like degree in different organizations the results were diverse and important, as shown by curves of graphic charts of admissions to sick report. Foot troops require particularly careful examination before being allowed to participate in campaign, especially as to their fitness as burden carriers; this includes freedom from disease, muscular development, condition of feet and general physical stamina. In the mounted service much of this does not apply. The mounted man is himself the burden and not a burden carrier. Weak feet, poor physique or slight ailment do not necessarily disqualify for ordinary campaign conditions. Physical standards are allowed to fall too low in many cases. Sufficient time should be taken to properly examine the men and exclude all unfits. After enlistment all substandards should be specifically looked for at the first opportunity and eliminated if there is reason to believe they will fail to accomplish the requirements of military service. Greater care is required in making inspections for concealed disease. There should be more training in marching. It will shake out men whose unfitness would otherwise be concealed. The idea that the disease is not transmitted through fomites is opposed. It is believed that immediate infection is possible under living conditions in military organizations and that every chance for such should be removed. Military life also affords many favorable opportunities for direct infection. Overwork and lowered resistance probably have little effect on suceptibility except through their interference with discipline. Troops from the country and small towns have a greater susceptibility to the disease. The exhaustion of non-immunity or not enables prophesies to be made as to whether or when more cases will occur. It is believed that improvement in general sanitation and ventilation prevented many cases, as shown by the incidence of the disease; 54 per cent. of the susceptibles in one group where discipline was lax and general sanitation poor had measles, while only 6 per cent.

in another group where there was better discipline were attacked. Discipline is the mainspring of sanitation. The quarantining of suspects prevents epidemics. Few prove negative and the time saved is valuable. The human factor in quarantine makes it inefficient unless there are physical obstacles to communication. A measles census to ascertain the number of suceptibles is desirable and it should be taken promptly on account of the tendency toward evasion where quarantine is being established. It is believed that no disinfection is necessary other than sunlight and ventilation. Early diagnosis is valuable. Attention is called to the danger of measles in causing a particularly fatal type of pneumonia. M. J. R.

The Nutritive Value of Margarines and Butter Substitutes.—HALLIBURTON and DRUMMOND (*Jour. Physiol.*, 1917, li, 235) recall that in 1915 Osborne and Mendel found that oleomargarine, as prepared from beef fat, contained the alcohol soluble accessory growth substance found in butter fat. The authors have given to rats a diet of casein, starch, salts, agar, yeast, and oleomargarine, and they found that this diet promotes normal growth and reproduction of species, and concludes that this fat is the nutritive equivalent of butter. Vegetable oils, however, have not the same nutritive value. When in the above diet a substitution of oleomargarine is made by any one of the following: cocoanut oil, cotton-seed oil, arachis oil, hydrogenated vegetable oils, by nut butters prepared from crushed nuts and vegetable oils—there is no proper growth of young rats. In other words, these materials contain little or none of the fat-soluble accessory substance. The authors summarize the practical results of their work as follows: "But when we approach the subject of the dietary of the poorer classes the question is a more serious one. In ordinary times the consumption of beef dripping, which is considerable among the poor, would to a large extent supply the lacking properties of a vegetable-oil margarine. But at the present time beef itself is expensive and the opportunities of obtaining dripping are therefore minimized. At the same time the three important foods for children already enumerated (milk, butter, eggs) have risen in cost, so as to be almost prohibitive to those with slender incomes. The vegetable-oil margarines still remain comparatively cheap, and the danger is that unless measures are taken to ensure a proper milk supply for infants at a reasonable charge, these infants may run the risk of being fed, so far as fat is concerned, entirely upon an inferior brand of margarine, destitute of the growth-promoting accessory substance. It would be truer economy even for the poor to purchase smaller quantities of an oleo-oil margarine if they cannot afford the luxury of real butter." G. L.

Section of Surgery of the Head, Surgeon-General's Office.—A summary of the work accomplished by the Section of Surgery of the Head in the Surgeon-General's Office can be considered appropriately under the following heads: Organization, Personnel, Activities, Results. The Council of National Defense authorized the Subcommittee on Ophthalmology, April 26, 1917. The personnel of this committee wsa as follows: Dr. James Bordley, Jr., chairman; Dr. George E.

de Schweinitz, Dr. Nelson M. Black, Dr. Walter R. Parker, Dr. Allen Greenwood, Dr. William H. Wilmer.

A committee of Otolaryngologists had been formed by the national societies to secure the services of competent ear, nose and throat specialists. The personnel of this committee was as follows: Dr. Charles W. Richardson, Chairman; Dr. Harris P. Mosher, Dr. Burt R. Shurly, Major Theodore C. Lyster, U. S. A.; Surgeon G. E. Trible, U. S. N. August 15 this committee was authorized by the Council of National Defense as the Subcommittee on Otolaryngology.

With the idea in view that the injuries of the head seldom involve one structure it was deemed wise for these two committees to join forces for the puspose of devising the best means of concentrating all the activities devoted to surgery of the head. To develop further the work, July 7 the executive committee of the Council of National Defense added to the Subcommittee on Otolaryngology an oral surgeon, and to the Subcommittee on Ophthalmology a brain surgeon, these committees acting as a joint body to include all cases that could be classified under the division of surgery of the head.

The Surgeon-General had already contemplated such a plan and had assigned Major T. C. Lyster to the duty of making a thorough study of it. After a careful investigation Major Lyster requested the assignment of members of the joint committee for duty in the Surgeon-General's Office to assist in this work. Major Nelson M. Black was put in charge of ophthalmology, Major Harris P. Mosher in charge of otolaryngology, Major Vilray P. Blair in charge of oral and plastic surgery, Captain Charles Bagley, Jr., in charge of brain surgery.

The first activity engaged in by the committee was the listing of all the known specialists throughout the United States represented by the various subsections of the Section on Surgery of the Head and by preparing an indexed catalogue of these specialists. In determining the availability of applicants for service, assistance was rendered by an advisory committee which consists of well-known specialists in different parts of the country, to whom letters were sent requesting specific information. Through this means many of the most conspicuous men in the profession have joined the Medical Reserve Corps and have been assigned to duty in charge of the various Subsections on Surgery of the Head in the cantonments. Under them will be placed men of less experience who will be trained and later assigned to service in the base hospitals abroad.

Another duty of this sections is to suggest plans for a special head hospital pavilion to be erected in each national cantonment and to standardize the instruments and equipment to be used therein.

In addition to the cantonment hospital a special head hospital of one thousand beds was authorized by the Surgeon-General to be constructed and operated in France. This hospital is to include not only facilities and equipment for the care of the head surgical cases, in the way of operating room, laboratories, roentgen-ray department, etc., but it will have a complete optical shop for the grinding and repair of lenses for use in spectacles and various instruments as well as a complete instrument shop for the care and repair of the instruments of the entire plant. In order to simplify storage, transportation, etc., all instruments and apparatus have been standardized as much as possible. The lenses

to be worn by the soldiers, for instance, are all to be of the same size and shape. The frames will be carried in three stock sizes, which will permit of proper adjustment to any case. Plans for the organization of the army hospital have been studied and suggestions made, when requested, as to the personnel necessary for the work of the head section. The Subsection on Oral and Plastic Surgery suggested the plans for dental operating rooms, which are to be included in the special hospital building.

The visual and hearing requirements of the various branches of the Army, together with methods of detecting malingerers, have been submitted for study and suggestions. Arrangements are to be made to provide for the work of dental oral surgeons by the Section on Surgery of the Head.

The following-named publications have been authorized by the Surgeon-General:

The Subsection on Brain Surgery prepared a book on *War Surgery of the Nervous System*, which was published by the Surgeon-General's Office and printed at the Government Printing Office.

The Subsection on Oral and Plastic Surgery revised Blair's book on *Surgery and Diseases of the Mouth and Jaws*.

The Subsection on Ophthalmology edited a *Manual of Ophthalmology*. Three members of the section also furnished the manuscript to the Committee on Publication of the Council of National Defense of a book entitled *Ophthalmic Military Surgery*, with chapters on trachoma and tests for the detection of malingerers.

The Subsection on Otolaryngology has in preparation a *Manual of War Surgery in Otolaryngology*.

On request there was furnished an outline of the course of lectures to be given the officers in the cantonment base hospitals by the senior officer in each section, together with a list of books for a reference library.

In two of the subsections, namely, that on brain surgery and oral and plastic surgery, there were not enough available surgeons sufficiently trained in these specialties to qualify for the responsible positions they were to fill. To meet this demand, schools were established and intensive courses of study instituted at the following-named places: Officers' School of Plastic and Oral Surgery, Northwestern University Dental School, Chicago, Ill.; Thomas W. Evans Museum and Oral Dental School of Surgery, University of Pennsylvania, Philadelphia, Pa.; Neurosurgical School, Chicago, Philadelphia, New York; Neurosurgical, Plastic and Oral Surgery School, St. Louis, Mo.

Regular courses are being given in these schools by men conspicuous in the profession for their teaching experience. The courses are open (1) to those of large surgical experience, the object being to add special technic to their knowledge; (2) to develop the work in younger men who will be placed as assistants.

Officers of the Subsection on Brain and Plastic and Oral Surgery are being assigned to the cantonment hospitals of this country and to each base and evacuation hospital going overseas.

For the purpose of elucidating some of the problems of neurosurgery, especially infections of the brain cord and coverings, a laboratory was established September 1 at Johns Hopkins Medical School, Baltimore,

Maryland. The members of this laboratory staff are now diligently working on investigations of procedure and methods of treatment that can be adopted for general use in war surgery.

As a result of the activities of the Section on Surgery of the Head, 568 officers have been assigned active duty in the National Army and the National Guard Cantonment Base Hospitals or are being given special training for service at home or abroad.

Effects of Submarine Duty on Personnel.—Assistant Surgeon WALTER W. CRESS, U. S. N. (*Military Surgeon*, xl, 699), considers the hygiene of the submarine an interesting field and observes the lack of available literature on the subject. He conducted observations on the ventilation of the submarine and on the effect of submarine duty on blood-pressure, weight and hearing of the crew. Bacteriological examinations of the air, under different conditions under which the submarine acts, showed the presence of far fewer bacteria than in that of dwellings and battleships, and the number of microörganisms was greatly reduced when the ventilation was at its poorest as compared with the number present when it was at its best. It is believed that this low content is due to the high humidity and the absence of dust particles and the aspirating action of the engines. Discomfort experienced while submerged greatly exceeds that experienced when running on the surface. This is due to the rise in humidity and temperature as a result of the rapid evaporation of the battery fluid and the higher speed of the dynamos. The fumes of unburned oil from the exhaust when charging the batteries is considered likely to give rise to a transitory albuminuria. While the number of blood-pressure readings was considered too small for the drawing of definite conclusions, it is believed that long, continuous duty on submarines is conducive to high blood-pressure. The cause is not determined, but may be due to strain, lack of exercise and overeating, excessive use of tobacco or coffee or fatigue. A small loss of weight was noted after long trips, but this is not attributed to submarine duty *per se*, as such usually occurs during the first few days at sea on any vessel. An occupational deafness occurs in many individuals on submarine duty as a result of the vibratory movements and noises and the conditions favorable for the production of epipharyngeal and middle-ear catarrh. It is advised that thorough examinations be made of men before they are assigned to submarine duty and that no man be accepted who has had syphilis or the sequelæ or complications of gonorrhea. M. J. R.

Smoke and Powder Gases in Naval Warfare.—Surgeon D. N. CARPENTER, U. S. N. (*Military Surgeon*, xxxix, 461), concludes that there is danger to the personnel in naval action from powder gases in the enemy's explosive shells. This danger is greater in closed gun compartments than in turrets, and the gases may be distributed to all parts of the ship through the ventilating system. Owing to the positive internal pressure of the turrets there is no contamination of the turret air from the ship's own gun-fire. Owing to the possibility of fires being started from shell impact and explosion there is danger from smoke gases. Perforated funnels, ventilators, etc., may cause smoke contamination of any part of the ship, with serious effect

on the personnel. The fire-room force is also exposed to possible contamination from the furnace fires and coal bunkers. To prepare for such danger it is advisable to provide a liberal supply of a simple type of respirator to be used in the gun compartments, handling rooms, fire and engine rooms, turrets, etc. Suitable helmets should be provided for the use of the repair party in fighting fires; additional electric fans and blowers should be placed in closed gun compartments to be used in emergency, and oxygen cylinders should be provided for the use of the medical department in cases of asphyxia. M. J. R.

The Lobar Pneumonia Problem in the Army.—Major HENRY J. NICHOLS, M. C., U. S. A. (*Military Surgeon*, xli, 149), considers lobar pneumonia an especially important disease among soldiers, and states that it is to be expected in large camps in the winter months. He reports an epidemic and states that some suggestions of progress were reached which should improve the method of handling pneumonia in the Army. Through the differentiation of types or strains of the pneumococcus it has been shown that the majority of cases of lobar pneumonia are due to the introduction from without of epidemic types of the organism. This has thrown light on baffling questions of epidemiology; it is now possible to trace the spread of infection by types and to detect infected contacts and "carriers." The question of preventive inoculation can be approached with some confidence in the reliability of type immune reactions. Inclusive evidence as to the value of specific serum heretofore has been due to the lack of knowledge concerning types. The use of type serum for a type infection has greatly reduced the mortality. Direct evidence of contagion has been demonstrated, based on the determination of types. Pneumonia is now classed with meningitis and diphtheria, with the same method of transmission and problem of prevention. If effective the use of vaccination for prevention is considered a far more promising measure than isolation. M. J. R.

Reorganization of the Civilian Hospital on a War Basis.—SMITH (*Modern Hospital*, October, 1917) states that although present plans do not contemplate the use of civil hospitals to any great extent by the Medical Department of the Army, except in the event of a great emergency, certain suggestions may be made to civil hospitals preparing to be of service during the war. They should offer to the Government as many beds as possible, but they should be actual beds, readily available, and in sufficient number to be worth consideration. The size of the staff should be cut to the minimum in order to release as many physicians as possible for military service. The intern service should be organized on a one-year basis, in order to comply with the official regulations. They should prepare for the release of as many nurses as possible. They should admit as large classes of nurses as possible and prepare, if the emergency should arise, to graduate at least a part of the senior class of nurses early. They should be prepared to train nurses' aids whenever called upon to do so.

W. H. F. A.

REVIEWS

A Handbook of Practical Treatment. Edited by John H. Musser, Jr., B.S., M.D., Associate in Medicine in the University of Pennsylvania, and Thomas C. Kelly, A.M., M.D., Instructor in Medicine in the University of Pennsylvania. Volume IV. Pp. 1000. Philadelphia and London: W. B. Saunders Company, 1917.

In this IVth volume is brought up to date, under the same editorial names, the valuable work of the late and lamented editors of the first three, which were published in 1911. In so far as possible the contributors to the original volumes have in this one either indicated such new features of treatment as have been presented up to this time in the literature or have entirely rewritten their sections; and in those instances where death or other cause has prevented former authors from doing this, others have taken their places. Furthermore, distinctly new matter has been presented by special workers in their individual fields of study.

The introductory chapter upon the modern treatment of disease is contributed by Dr. Alfred Stengel, who reviews broadly the development of our present conception of medical treatment, and discusses briefly certain of the newer methods. Fortunately the sections by Dr. J. William White and Sir Lauder Brunton were revised for this work before their deaths, and appear under their names. Dr. Leonard G. Rowntree, as a new contributor, has completely revised the article upon nephritis, devoting 110 pages to this subject and presenting four very helpful charts in explanation of some of the newer methods of investigation and treatment of this disease. The Surgeon-General of our Army contributes an exhaustive but concise chapter upon one of the subjects with which his name is closely identified, yellow fever. The subject of tropical diseases is entirely revised by Dr. Bailey K. Ashford, as is that upon electrotherapy by Dr. Charles S. Potts, and upon the surgery of the liver and gall-bladder by Dr. John B. Deaver. Dr. Joseph L. Miller has rewritten the chapter upon the diseases of the blood, and Dr. George Morris Piersol has made several contributions, revising certain sections of which he was formerly only a co-author.

Among the entirely new matter contained in this volume are

the treatment of cerebrospinal syphilis by Swift, hay fever by Goodall, acidosis in children by Howland and Marriott, occupational diseases by Thompson, governmental prophylaxis by Dixon, peridental suppuration by Smith and Barrett, and splenectomy in the anemias by Krumbhaar and Pearce. The reviewer is unable to think of any valuable medical or surgical practice that is not now discussed in these four volumes, and feels that the names of the contributors are significantly indicative of the illuminating manner in which the subjects are presented.

Not the least important feature of the work is the exhaustive index of 67 double-columned pages which it contains. It is fitting also to call attention to the complete and separate 218-page desk index to the four volumes which accompanies this one. Mechanically both the volume and the desk index are well done, the binding being good, the type clear, the tables well presented, and most of the illustrations excellent. T. G. M.

REST, SUGGESTION AND OTHER THERAPEUTIC MEASURES IN NERVOUS AND MENTAL DISEASES. By FRANCIS X. DERCUM, M.D. Second edition. Pp. 395. Philadelphia: P. Blakiston's Son & Co., 1917.

THIS volume is a revision of Volume I of the *System of Physiological Therapeutics*, edited by Dr. J. Solis Cohen. As its title indicates it concerns itself with the method of treatment of nervous and mental conditions.

To begin with, probably no one in this country has had a larger experience in the treatment of the neuroses than Dr. Dercum. To gain such results it is apparent that his methods must be successful, and therefore whatever he writes upon this subject should be of the utmost interest.

The book is divided into three parts: (1) on rest; (2) on therapeutics of mental diseases; (3) on suggestion. Each is divided into appropriate chapters. In the first part, which concerns itself with the subject of rest, the author discusses the chemical, morphological and physical changes which occur in the sick person. He then takes up the symptoms of the fatigue neuroses, then the special rest treatment as applied to the neurasthenic, giving in detail the methods to be employed. This chapter is particularly interesting because it gives in large part Dr. Dercum's experiences of many years. The nature of hysteria is then discussed. The author distinguishes between simple neurasthenia and psychasthenia and hysteria from hypochondriacal conditions. He inclines to Babinski's view-point as to the presence of symptoms due to the examination of the physician. These views, as many others, are being radically changed as the result of experience gained from the present war.

He then discusses symptoms and treatment of hypochondriacal conditions and the rest treatment of such conditions as chorea, epilepsy, paralysis agitans and organic conditions of the nervous system.

In the second part the prevention of insanity and the general principles of the treatment of the insane are first discussed and then treatment of the special forms of mental diseases. In the last division on suggestion the author takes up the ordinary forms of suggestion, then discusses all the special cults, including those of Mrs. Eddy. Lastly he discusses the psychoanalytical method.

This is an excellent book, full of common-sense methods for the treatment of all forms of nervous conditions, a copy of which should be in the hands of every physician. T. H. W.

THE MASTERY OF NERVOUSNESS. By ROBERT S. CARROLL, M.D. Pp. 360. New York: Macmillan Company, 1917.

As its title indicates this volume concerns itself with the exposition of the nature of nervousness and its cure. The book has been written for the laity. The healthy, vigorous normal individual need not read it. It is only the neurotic, who seeks to master his nervousness, who will read such a work as this, because he thinks that from its perusal he can gain what he seeks—health. For such a person this work is valueless. It is not because this volume is not well written, for it is. The author apparently has had a wide experience and writes fluently and well, but practical experience has shown that for the neurotic all works of this character are of the greatest harm, for it is well known that such a person will apply every symptom to himself, for he is incapable of normal reasoning. For the physician it is not scientific enough. Many books of this kind have been published in the last few years. This is one of the best of its kind, but it is a pity that the author, who knows what he is talking about, should not have directed his energy in a more productive line.

T. H. W.

SUGGESTIVE THERAPEUTICS. By HENRY S. MUNRO. Fourth edition, revised and enlarged. Pp. 481. St. Louis: C. V. Mosby Company, 1917.

THIS is the fourth edition of this work, the first having been reviewed in this JOURNAL some years ago. If repeated editions are an indication of the need of a book and of its success, then from these standards this book is a success, and there is need for it. Yet this book is altogether unscientific. It is written for the general practitioner. The text is in the conversational style, the author giving many examples of methods employed by him. Every phase of suggestion is discussed as applied to every sort of condition: for

example, hypnotism as applied to bronchitis, asthma, pneumonia, dressing of a painful wound; various operations, such as suprapubic cystotomy, dental surgery, insomnia, psychic impotency, the nausea and vomiting of pregnancy, alcoholism, pulmonary tuberculosis, etc. The methods used in applying hypnotism are given at length. Chapters are written on suggestion as an adjunct in the administration of anesthetics, on psychotherapy in relation to the expectant mother, the psychological factor, obstetrics and the technic of application. In the discussion of the sex phase the author goes into the subject at length. His advice is very good and method of the treatment of this phase is sound. The author differs from Freud not only in his principles but in the application of them, stating that the principles of Freud are limited and that the method advocated by him are harmful, etc. The author does not hesitate to state that his views are much better than those of Freud and that his experience is even larger. His knowledge of Freudian psychology is based upon his reading of certain articles, which he frankly quotes. T. H. W.

THE GROWTH OF MEDICINE FROM THE EARLIEST TIMES TO ABOUT 1800. By ALBERT H. BUCK, B.A., M.D., formerly Clinical Professor of Diseases of the Ear, Columbia University, New York; Consulting Aural Surgeon, New York Eye and Ear Infirmary. Pp. 582. New Haven: Yale University Press, 1917.

To attempt to present in one volume the history of the growth of medicine from the earliest times to about 1800 is a difficult task, but a most desirable one. Dr. Buck has been admirably successful, the work, although of less than 600 pages, including many illustrations, yet presents in plenty of detail all of the most important steps in the long story of medical history. Because of its brevity there is a continuity of thought and chronological progress which is so often lost in the maze of detail of more lengthy works. For this reason the book should become more and more popular with practitioners and undergraduate students of medicine who desire to reap ideals and stimulation from the lives and achievements of the masters of medicine.

The work is entertaining from beginning to end, is well illustrated and very clearly printed.

It is the first work published by the Yale University Press on the Williams Memorial Publication Fund, which was founded to enable "the Yale University Press to accept for publication medical treatises which deal with the historical and scientific questions of this branch of knowledge, but which, for sound business reasons, cannot be published on a merely commercial basis."

The reviewer begs to prophesy that in this instance the book will not only prove to be a credit to the author but a success on a merely commercial basis. O. H. P. P.

PROGRESS
OF
MEDICAL SCIENCE

SURGERY

UNDER THE CHARGE OF

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Dakin's "Dichloramine-T" in the Treatment of the Wounds of War.—SWEET (*British Med Jour.*, August 25, 1917, p. 249) says that he has treated some 80 cases with "dichloramine-T" (toluine-para-sulpho-dichloramine); some have been old cases with foreign bodies lying in the bone, and suppuration did not stop until the foreign body was removed. Fresh cases, in which enough integument was left to permit it, have been treated with dichloramine once and immediately closed, and have healed by secondary intention; 16 cases, old and fresh, were cultured after treatment with "dichloramine-T" for varying periods, of which 11 gave no growth whatever; of the 5 in which a growth appeared, 4 were old cases of deep bone involvement; the only growth was the Staphylococcus aureus in 4 cases and in 1 case the pyocyaneus. The wound fills rapidly with granulation tissue of healthy color, which exhibits no tendency to become water-soaked and indolent; the skin edges grow in rapidly. The surgeons of the unit, with Dr. Sweet, are agreed that the wounds treated by "dichloramine-T" are in every way as satisfactory as they have seen under any method: The new "dichloramine-T" solution is made by dissolving the crystals of "dichloramine-T" in chlorinated eucalyptol and then diluting this solution by the addition of chlorinated paraffin oil. It is best applied by an oil spray, an ordinary hard-rubber or all-glass atomizer being the most practical method. It is of great advantage in wound treatment, even if the final results are no better, because it saves the pain of wound dressing; it affects an appreciable saving of dressing material; the amount of solution is of small bulk; the number of wounds which a surgeon can dress in a given time is far greater than by any other method; the elimination of the Carrel tube simplifies the dressing and the problem of the transportation of the wounded. The elimination of the Carrel tube saves the time of the nurse for the periodic flushing.

Gunshot Wounds of the Knee-joint Treated in a Base Hospital.—CAMPBELL and WOLFENDEN (*Lancet*, August 11, 1917, p. 185) say that these wounds have furnished one of the most difficult surgical problems of the war and their treatment, after nearly two and a half years, appears to be far from satisfactory. According to the anatomy and physiology of the joint the lines along which all treatment in septic cases must be directed are: (1) The lowering of intra-articular tension by evacuation of the exudate, thereby preventing the tracking of infection along the fascial planes; (2) the rapid overcoming of infection and the removal of infective material as soon as it is formed, thereby diminishing suppuration; (3) the promotion of the formation of adhesions, thereby limiting the area of infection and diminishing the surface for toxic absorption; (4) the removal of pressure from the articular cartilage, thereby diminishing the chances of its becoming eroded. Their present methods of treatment in severe cases are based upon three fundamentals: (1) Absolute rest and fixation; (2) the strictest asepsis; (3) the use of Carrel's method of wound treatment. With this method efficiently carried out they find that infection is most effectually counteracted; that organisms and the pabulum suitable for their growth are washed outward, even from the deepest parts of the wound; that ingress of sepsis from without is prevented, a most important consideration in the treatment of knee-joint cases; that pus forms only in small quantity; that adhesions of the synovial membrane form with great readiness; that the patient need only be dressed in twenty-four or forty-eight hours. Earlier their cases were treated by the saline method. Comparing the last series of results so gained with those obtained recently when using Carrel's method they find that in the latter the mortality is reduced to one-fourth and the number requiring amputation to one-eighth, although the cases treated by Carrel's method were, if anything, more severe. From their limited experience they are not disposed to advise excision of the joint as a method of treatment in septic arthritis.

Surgical Methods of Dealing with Pelvic Infections. — CULLEN (*Surg., Gynec. and Obst.*, 1917, xxv, 134) says that when an appendix abscess is opened the appendix can practically always be removed at the same time, provided the abscess is well walled off with gauze before an attempt is made to open it. In removing a large pus tube that is firmly adherent to the pelvic floor, it is better to begin by excising a wedge of the uterine cornu, and gradually freeing the mesosalpinx. The tube can then be lifted up as a straight rod and carefully walled off on all sides before it is shelled off from the pelvic floor. Soiling is reduced to a minimum. Pelvic drains that emerge from the vagina should be so arranged that they do not come into contact with the small intestine. Vaginal drains laid in the pelvis during an abdominal operation should not be removed, as a rule, before the fourth or fifth day on account of the danger of pulling down an adherent loop of small bowel. The vaginal drainage of a pelvic abscess may relieve the patient only temporarily. The development of other incipient abscesses may require several more vaginal operations before the inflammation subsides, and even then a subsequent abdominal operation may be necessary. No case of pelvic abscess should be irrigated. There is danger of rupture of

the abscess wall and of the escape of infectious fluid into the abdomen which will set up a general peritonitis. Postpuerperal infections are found, as a rule, in one or both broad ligaments. Those in the broad ligaments can be most satisfactorily opened extraperitoneally through a gridiron incision just above Poupart's ligament. Such accumulations should rarely, if ever, be opened through the vaginal vault.

THERAPEUTICS

UNDER THE CHARGE OF

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Clinical Studies on the Respiration. IV. The Vital Capacity of the Lungs and its Relation to Dyspnea.—This paper by PEABODY and WENTWORTH (*Arch. Int. Med.*, 1917, xx, 443) is really a continuation of the preceding in which they showed that patients with heart disease became dyspneic more easily than did healthy subjects because of their inability to increase the depth of breathing in a normal manner. The inability to breathe deeply corresponds to a diminished vital capacity of the lungs as measured by the volume of the greatest possible expiration after the deepest inspiration. The investigators employed two different methods of measuring the vital capacity. One was by use of a calibrated recording spirometer, the other by the use of an ordinary portable spirometer. They determined that the position of the patient made no practical difference in his vital capacity. One hundred and forty healthy adults were studied. They were classified according to sex and height. Of the males there were three groups: Group 1 consisted of those persons 6 feet tall or over whose normal capacity was 5100 c.c. Group 2 consisted of men between 5 feet 8.5 inches and 6 feet tall with a normal vital capacity of 4800 c.c. Group 3 consisted of men whose height was between 5 feet 8.5 inches and 5 feet 3 inches, whose vital capacity was 4000 c.c. Though the vital capacity of some subjects was very much greater than that called for by their group position, only 1 of the 96 normal males had a vital capacity more than 10 per cent. below the appropriate normal standard. Peabody and Wentworth conclude that healthy males almost invariably have a vital capacity of 90 per cent. or more of the normal standard. The women were also divided into three groups: Group 1 measured over 5 feet 6 inches; vital capacity 3275 c.c. Group 2 measured from 5 feet 4 inches to 5 feet 6 inches, with an average vital capacity of 3050 c.c. Group 3 made up of persons who measured from 5 feet 1 inch to 5 feet 4 inches; vital capacity 2825 c.c. In five of these women the vital capacity was more than 10 per cent. below the appropriate normal, but in no case was it more than 15 per cent. below. 224 observations on 124 patients suffering from cardiac disease showed that the clinical condition of the patient, more especially the tendency to dyspnea varied directly with the degree to which the vital capacity was diminished.

Patients with a vital capacity of 90 per cent. or more of the appropriate normal standard adopted for their sex and height had little or no abnormal tendency to dyspnea. Patients with a vital capacity of from 70 to 90 per cent. of the normal became short of breath on unusual exertion and must lead a restricted life, although many of them can do light work. Patients with a vital capacity of from 40 to 70 per cent. of the normal become dyspneic on moderate or slight exertion, are rarely able to work, and frequently suffer from cardiac decompensation. Those with vital capacity of less than 40 per cent. are decompensated patients, usually confined to bed, and the mortality in this group is high. There is a close correspondence in the individual case between changes of vital capacity and variations in the tendency to dyspnea. In stages of decompensation the vital capacity falls, and with recovery the vital capacity rises. Comparatively slight changes in the patient's condition may manifest themselves in changes in vital capacity. Indeed it is possible by studying the variations in vital capacity to throw much light on the course and even on the prognosis of the disease. In various other diseases in which mechanical conditions interfere with the movement of the lungs, such as pleural effusion, cirrhosis of the liver with ascites, etc., the tendency to dyspnea corresponds closely to the decrease in vital capacity. This, however, is not true for the anemias, where the dyspnea appears to be due to the low hemoglobin content of the blood. In acute nephritis the vital capacity was not decreased below the normal. In chronic nephritis without evidence of heart disease and without history of dyspnea, vital capacity was usually within the normal limits. In cardiorenal cases where dyspnea was a prominent symptom, vital capacity was usually decreased in proportion to the intensity of the dyspnea. In diseases in which dyspnea is not a prominent symptom, such as acute and chronic arthritis, diabetes, hemiplegia, tabes, and in surgical convalescence the vital capacity is usually within the normal limits, although general weakness and old age may cause a slight decrease.

Clinical Studies on the Respiration. V. The Basal Metabolism and the Minute-volume of the Respiration of Patients with Cardiac Disease.—PEABODY, WENTWORTH and BARKER (*Arch. Int. Med.*, 1917, xx, 468) report their observations on the gaseous metabolism and pulmonary ventilation of two groups of patients with heart disease. Group 1 consists of subjects in good or fairly good condition, in whom the vital capacity of the lungs was over 60 per cent. of the normal. Group 2 consists of much more severely affected patients in whom the vital capacity was 60 per cent. of the normal or less. The basal metabolism calculated from the oxygen consumption per square meter of body surface averaged 2.5 per cent. above normal in Group 1, and 12.8 per cent. above normal in Group 2. The average volume per respiration was less in Group 2 than in Group 1, and the average rate of respiration was higher in Group 2 than in Group 1. The minute-volume of air breathed averaged approximately 30 per cent. higher in the members of Group 2 than it did in those of Group 1. The relation is pointed out between the increase of the minute-volume of the more seriously affected patients and the decrease in the vital capacity of the lungs. Finally it is shown that this high minute-volume is a factor in the production of dyspnea in persons with severe heart disease.

PEDIATRICS

UNDER THE CHARGE OF

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Hypertrophic Stenosis in Infants.—HOLT (*British Jour. Children's Dis.*, xiv, Nos. 163–165) states that hypertrophic stenosis of the pylorus in infancy is a pathological entity and it should not be confused with other pathological conditions which may be accompanied by vomiting and occasional gastric peristalsis. Many of the milder forms recover under medical treatment. If improvement is not noticed in the course of two or three weeks of medical treatment, and those which show severe symptoms, surgical treatment is indicated. These symptoms demanding surgical attention are rapid loss of weight, persistent vomiting and forcible, gastric peristalsis and the presence of a palpable tumor and abnormal gastric retention. The value of the roentgen rays is not so great as the study of gastric retention. In cases in which the symptoms have persisted for several weeks before they come under observation are best treated surgically as soon as a diagnosis is made. The author recommends the simple external division of the circular muscular fibers as recommended by Rammstedt rather than gastro-enterostomy, divulsion, pyloroplasty and such operations. The Rammstedt operation has been shown to be of greater value than any other operation and even better than medical treatment. Growth and development are not interfered with by this operation. Cases not operated on usually show no symptoms after the first year, but are possibly the basis of pyloric obstruction later on in life.

Intradermal Reactions to Proteins of Infants Suffering from Gastro-intestinal Disease.—GREER (*Arch. Pediat.*, xxxiv, No. 11) says that in children suffering from gastro-enteritis or atrophy 23 out of 26 gave definite intradermal reaction to lactalbumin of the cow. Three reacted positively to caseinogen. The much greater reactivity to lactalbumin is in agreement with the observation that almost all allergic milk reactions proceed better with lactalbumin than with caseinogen. These findings suggest that sensitization to cow's milk protein does occur in acute or chronic gastro-enteric disturbance and that such sensitization can be demonstrated by the intradermal injection of small amounts of these proteins, and, further, that the lactalbumin is the protein to which, probably, sensitization most easily occurs.

Meningococcus Meningitis in the Newborn with Interesting and Unusual Features.—MILLER (*Arch. Pediat.*, xxxiv, No. 11). This case showed the following features: The onset, with conjunctivitis, which was mistakenly regarded as gonorrheal; the bulbous eruption in the second week of the disease; the prolonged latent period before

signs of meningitis were apparent (fourth week); the peculiar character of the spinal fluid (tapping is liable to be unsatisfactory in the newborn, as fluid does not flow readily from the subarachnoid space, and in this case gelatinized at once); the large number of punctures of the fontanel (10) in so young a patient, with no apparent ill effect beyond vomiting (the first two of these punctures were made into the ventricle and afterward, with the greater accumulation, the needle probably entered the subarachnoid space); the large amount of serum introduced (in all 260 c.c.), with no sign of serum disease; the remarkable sclerema-like condition of the skin, persisting throughout the attack; the apparent improvement in the clinical symptoms and the cerebrospinal fluid after the tenth injection of serum, with the subsequent return of active symptoms and death.

OBSTETRICS

UNDER THE CHARGE OF

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Labor Conducted under Gas and Oxygen in Two Cases of Lost Cardiac Compensation.—GETTMAN (*Jour. Am. Med. Assn.*, February 17, 1917) reports the case of a multipara who for three years had suffered from heart disease, with difficult respiration and swelling in her limbs. For the seven months preceding, she had been unable to walk and could not sleep except in a sitting posture. On admission to the hospital, her hemoglobin was 58 per cent., the urine showed albumin and granular casts, and mitral insufficiency, with lost compensation, was present. The patient was pregnant eight and a half months. Her previous labors had been without difficulty and the pelvis was normal. For nine days she received medical treatment, and, when labor began, she was transferred to the obstetrical department of the hospital. The first stage of labor went fairly well, but, when expulsive efforts began, the patient became cyanosed and almost pulseless. Nitrous oxide oxygen were administered and the patient was delivered of a full-term, living child by version and extraction. She passed through this very successfully and improved for nine days when she suddenly developed cardiac dilatation and died six hours later. The second case was that of a primipara, aged forty-three years, who had mitral regurgitation for five years. She had attacks of cholecystitis at intervals, and eleven years before had ventral suspension for retroversion. There had been edema of the feet and legs for three months, and the patient slept in a sitting posture. On examination the heart was dilated and its action irregular and weak. The child was in transverse position, and, as the patient was a primipara, it was thought best to deliver by Cesarean section under gas and oxygen. This was done successfully, the patient enduring the anesthetic and the operation well. The child was at full-term and in good condition. Mother and child left the hospital in two

weeks. These cases demonstrate the fact that gas and oxygen were used successfully. Without wishing to deny the virtue of gas and oxygen, the reviewer must call attention to the fact that the same thing has been done successfully under other anesthetics. Provided oxygen be used freely, either chloroform or ether can be employed in heart cases for delivery. Anesthesia is an absolute necessity with these patients, and saves life during the strain of labor. The omission of an anesthetic would be followed by death during labor.

Labor Complicated by Occipitoposterior Positions Treated by Digital Rotation.—PECK (*Am. Jour. Obst.*, March, 1917) contributes an article upon this subject, with illustrations, and believes that these cases can be best managed by digital rotation. He finds that the positive diagnosis of the exact position of the head is essential, and is best made at the beginning of the second stage of labor immediately after the rupture of the membranes and during the contraction of the uterus. Attempts at digital rotation before the vertex is engaged in the pelvis usually end in failure because conditions are unfavorable. Digital rotation should be applied during uterine contractions and after the occiput is upon the floor of the pelvis. Rotation should be gradual, and the effort may have to be continued through several uterine contractions before the occiput remains anterior. In some cases the occiput seems more movable when the uterus is relaxed, but then the fingers cannot exert their full power in rotation because the tendency is for the fingers to slip off the bony ledge from forward displacement of the uterus. After anterior rotation has been secured, no effort should be made to deliver the child for some time in order to secure molding of the head. Digital rotation may often be used preceding the application of forceps. By this means, a favorable position is obtained for the direct application of forceps to the sides of the head. Should attempts at digital rotation fail, no harm has been done to mother or child.

Drainage of Pus Conditions in the Pelvis during Pregnancy.—REDER (*Am. Jour. Obst.*, December, 1916) believes that the most satisfactory evidence of the presence of pus in Douglas's cul-de-sac can be obtained by rectal examination. If there is a considerable accumulation, it is readily recognized, but if the quantity of pus is small, it may be necessary to examine with the finger without a glove. It is well to recognize these conditions as early as possible as the continued presence of pus in the pelvis during pregnancy is a dangerous factor. In choosing the method of operation, it is well, if possible, to drain the abscess through the rectum. The anus is first gently dilated and the rectum thoroughly washed out. The index finger without a glove finds the most fluctuating spot and a sharp-pointed bistoury is passed along the finger and cautiously introduced. As soon as the pus is encountered, the bistoury is withdrawn, and the point of a dressing forceps introduced into the opening. By spreading its branches, a hole sufficiently large to admit the end of a rubber drainage tube is readily made. This tube is retained for a week and then removed. The operation may be performed with, or without an anesthetic.

GYNECOLOGY

UNDER THE CHARGE OF

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The Blood in Cancer under Roentgenotherapy.—As a result of an extensive study of the blood of patients undergoing roentgen treatment for cancer, STEVENS (*Am. Jour. Roentgen.*, 1917, iv, 215) summarizes his preliminary report by stating that roentgen rays, applied in repeated large doses, with deep penetration, profoundly affect the erythrocytes of human beings, contrary to most of the reported experiments on small animals. This effect consists of a considerable diminution in number from the fourth to the sixth day after treatment, then with vacillations rapidly increasing in number until the tenth or eleventh day, so that there may be a decided erythrocytosis with some vacillations. This may be followed by another drop and in cases where several treatments have been given over several weeks, the figures may not fully recover their former level before the end of forty or fifty days. For the first few days after a treatment the lymphocytes are suppressed or destroyed by large doses of roentgen rays in the treatment of cancer. In favorable cases this is followed by a reaction with lymphocytosis between the third and seventh days which may continue almost uninterruptedly until the fourteenth day or it may stop short after the seventh day and reappear more strongly and persistently on or about the fourteenth day. There is a strong resemblance between the curves of these lymphocytic reactions and those which constitute the opsonic index. The treatment should probably not be repeated until the reaction is over, and the repetition of the dose should probably be governed by the reactions in the blood as well as in the skin, the former being much more sensitive than the latter. In some cases of cancer, the roentgen rays tend to stimulate a general (though probably temporary) immunity, if lymphocytosis is an indication of immunity. The action of the roentgen rays in cancer therefore would appear to be twofold—local, by destruction of disease cells, and general, by stimulating lymphocytosis and consequently resistance.

Surgical Hemostasis of the Female Pelvis.—A most interesting stereoradiographic study of the vessels of the female pelvis was executed by FURNISS and MEYER (*New York State Jour. Med.*, 1917, xvii, 462), with three definite objects in view: (1) they desired to show the degree of anemia that could be produced by the ligation of certain vessels or certain groups of vessels; (2) to show the most effective methods of producing anemia for surgical operations, and finally to show the minimal amount of blood supply compatible with adequate tissue nutrition. This study was conducted by injecting into the arterial system a mixture of red lead and albolene, after the ligation of certain vessels. After the removal of certain ligatures, further injections were

made and other radiographs taken. This was continued until all the ligatures were removed. As a result of this work it was found that with ligation of the common iliac arteries, together with the ovarian arteries, the only vessel filled in the pelvis is the superior hemorrhoidal branch of the inferior mesenteric; release of the ligature on the external iliac makes little or no difference in the filling of the pelvic vessels. The internal iliac vessels can be filled through only one ovarian vessel. While branches of the last lumbar arteries and of the gluteal and iliolumbar branches of the internal iliac can be seen in close proximity, the passage of the injected mass from one to the other cannot be demonstrated. Had there been branches sufficiently large to pass the injected material, it should have been demonstrated by the injection when the common iliacs and the ovarians were tied. Therefore it would seem that a most extensive and dangerous ischemia would be produced by the ligation of the ovarians and common iliacs, or almost as complete an ischemia by the ligation of the ovarians and internal iliacs. The authors believe that bleeding would be lessened by the ligation of one ovarian and both internal iliacs, or both ovarians and one internal iliac, without seriously endangering the nutrition of the pelvis, provided that structures through which the vessels crossed the median line were not removed. Further, that possibly the ligation of the ovarian and both internal iliacs during a hysterectomy would leave an inadequate blood supply, and that ligation of the ovarian and the uterines would give good hemostasis and yet leave sufficient blood supply. Investigations of this nature should be greatly encouraged as the findings should be of considerable value to the gynecologist in dealing with cancerous growths in the pelvis, especially when using the newer cautery technics in which extensive ligation of pelvic bloodvessels is an important part of the procedure.

Preservation of Menstrual Function in Tubal Disease. — Practitioners who have been watching the literature of recent years will remember that considerable attention has been paid to the subject of pelvic inflammatory disease in all its forms by Polak and his staff. In his latest contribution, POLAK (*Jour. Am. Med. Assn.*, 1917, lxix, 1938) states that while all are agreed that the retention of an infected uterus, after removal of infected tubes, is a menace to the woman's future health, he personally believes that when so much care is taken to preserve the function of ovulation, there should be like care in preserving the function of menstruation, as ovulation without menstruation contributes little to the patient's well-being. Sections through the uterus, between the fundus and internal os show practically no pathological changes in these inflammatory cases, but the greatest pathology in the uterus is to be found in the cervical glands and in the fundal region and pars interstitialis of the tube. In order, therefore, to clear the patient from these infective foci, many operators have been performing a panhysterectomy, which, to be sure, entirely rids the patient of the infection, but also deprives the patient of further menstrual flow. In order to obviate this unpleasant sequel, but at the same time to thoroughly rid the patient of her infection, Polak has been treating the cervix by linear cauterization or excision following which he attacks the tubes and fundus of the uterus by the method of Beuttner and Bell. This procedure consists of the ablation of both tubes with the

resection of the infected fundus of the uterus, leaving sufficient healthy uterine body to conserve the menstrual function and one or both ovaries to continue ovulation. The operation should be done without interfering with the ovarian circulation, hemostasis being secured by the ligation of the individual branches supplying the tube and fundus. With the bleeding controlled, a wedge-shaped excision is made of the upper part of the body and fundus of the uterus. The anterior incision begins just posterior to the insertion of the round ligament and runs across the front of the uterus to a corresponding point on the opposite side. The posterior incision begins between the tubal insertion and the ovarian ligament on one side and extends across the posterior surface to the same point on the opposite side. The incision is made in such a manner that the entire fundal mucosa with the pars interstitialis and surrounding tissues of both sides are excised. By means of this operation, sufficient endometrium is allowed to remain to perpetuate menstruation.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES

UNDER THE CHARGE OF

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Cyst of the Larynx.—CHAMBERLIN (*Laryngoscope*, August, 1917) reports a case in a well-developed child who had had a peculiar cry almost from birth, shortly followed by inspiratory stridor which had become markedly worse during six months. There was no history of dyspnea or of cyanosis. The interior of the larynx could not be inspected with the aid of the laryngoscopic mirror, but under suspension a large tumor mass was seen to occupy the entire right side of the larynx, rendering a view of the interior impossible. An hypertrophied fold of mucous membrane at the summit of the left aryepiglottic fold flapped back and forth in the air stream, and accounted for the stertor. It was resected and the stertor ceased. A long knife inserted into the tumor with a view of determining its consistence gave exit to 1 or 2 drams of a brownish viscid, almost gelatinous liquid, and the tumor collapsed. Careful examination failing to reveal its walls or even the wound of the stab. It was thought that the tumor had been situated on the right aryepiglottic fold. An excellent and unobstructed view of the entire larynx and several rings of the trachea was at once possible. There had not been any recurrence of trouble up to the time of the report.

Excision under Suspension Laryngoscopy of a Carcinoma of the Larynx: No Recurrence in Three Years.—MAYER (*Laryngoscope*, February, 1917) reports this case in which under suspension laryngoscopy be excised with long-handled, curved right and left scalpels a carcinomatous epiglottis which he exhibited at the New York Academy of Medicine. Save for a rather alarming hemorrhage on the second

day after the operation, an uninterrupted recovery ensued. The patient, a man, aged sixty-four years, had not experienced any discomfort whatever from the loss of his epiglottis, deglutition and vocalization being perfect.

Diphtheritic Membranes in the Lung Diagnosed and Removed under Bronchoscopy.—SKILLERN (*Laryngoscopy*, February, 1917) reports the case of a boy, aged seven years, supposed to have inspirated a bead which accounted for existing cough and attacks of suffocation. Physical exploration of the chest and fluoroscopic examination were practically negative. Under bronchoscopic inspection there was detected, a little above and at the lower lobe bifurcation of the right lung, a membrane which bled on being loosened with a dull hook. It was not deemed prudent to continue manipulation at that moment. Two hours later dyspnea became so urgent as to require immediate tracheotomy. Three days later the membrane was loosened under bronchoscopy and on account of friability was found removable only piecemeal. Some pieces of membrane were coughed out through the cannula during the night. The tube was removed on the seventh day, the child being entirely well. Nine months previous to this clinical history the patient had gone through a severe attack of diphtheria followed for some two months by a cough which had cleared up entirely.

Gunshot Wounds of the Larynx.—COULET (*Revue de Laryngol., d'otol. et de rhinol.*, July 15, 1917) has found but one gunshot wound of the larynx among 1200 wounded soldiers under his care. He reports a case of gunshot wound of the larynx, followed by abscess and recurrent paralysis. A bullet from a great distance had passed through the neck without injuring the great vessels, but had injured the arytenoid region and induced local inflammatory action; and it had injured the recurrent nerve in passing. A good recovery ensued, but the paralysis of the left recurrent remained permanent.

Chancre of the Pharyngeal Tonsil.—HADEN (*Laryngoscope*, August, 1917) reports the case of a married woman, aged twenty-five years with headache unaccountable for by her eyes or her general condition. Though there had not been any history of trouble in nose or throat, posterior rhinoscopy, a swollen, bright red pharyngeal tonsil with apparent ulceration of its surface. Three days after an application of argyrol, though the pain became so severe as to require the administration of morphin, the patient expectorated a section of the pharyngeal tonsil which on microscopic inspection was found to contain numerous living Spirochetæ pallida. At this time a typical secondary rash appeared upon the body. Salvarsan was administered the next day, and the headache subsided.

Septic Arthritis following Submucous Resection of the Nasal Septum.—IMPERATORI (*Laryngoscope*, March, 1917) reports a case of septic arthritis of the knee-joint following resection of the nasal septum. Fluctuation was evident on the ninth day after the operation. The joint was opened and considerable pus was found with manifestations of extensive destruction of the articular cartilages.

Saddle-nose Deformity after Submucous Resection of the Septum Corrected by Transplantation of Bone.—CARTER (*Laryngoscope*, February, 1917) reports a case in which eighteen months after resection of the nasal septum, he corrected a resultant saddle-back deformity by transplanting about two inches of the ninth rib, working by the intranasal route. The deformity was completely corrected and the nose is as strong as it ever was.

PATHOLOGY AND BACTERIOLOGY

UNDER THE CHARGE OF

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Formation of Methemoglobin by Streptococcus Viridans.—In the classification of the streptococci, constant use is made of the formation of methemoglobin upon blood agar by the organisms of the viridans group. This alteration of the blood pigment is readily distinguished, but the manner in which the bacteria act to cause this change is not very apparent. BLAKE (*Jour. Exper. Med.*, 1916, xxiv, 315) found that the change from oxyhemoglobin into methemoglobin took place only in the presence of the living microörganisms. The reaction appeared to depend upon the metabolic activity of the bacteria and had no relation to the virulence of the particular strain. The intensity of the activity bore some relation to the rapidity of multiplication. Hence it is found that the change in the hemoglobin was most marked when the medium contained the optimum of nutritive materials. Dextrose was one of the substances which enhanced the reaction. The results obtained by the author with the Streptococcus viridans are very similar to those reported by Cole for the pneumococcus. In both instances the reaction appears to depend upon processes of oxidation and reduction, for the result cannot be obtained in the absence of oxygen, while it is retarded when too much oxygen is present. There is no evidence that the change in the hemoglobin is due to a specific secretion on the part of the microörganism. The author points out that the results of the experiments suggest the manner in which bacteria may be injurious to other tissues by disturbances in oxidation because of the metabolic activities of the organism. This theory, it is suggested, is particularly applicable to the Streptococcus viridans because the lesions produced by it are prone to be localized and associated with the actual presence of the streptococci.

Agglutination of Treponema Pallidum in Human Syphilis. — Numerous attempts have been made to determine the presence of agglutinins in the sera of infected people or in experimental animals. Many of these studies failed to demonstrate agglutinins in sufficient quantity to make the test practical. On the other hand a few investigators believe that a technic is available whereby these specific substances can be recognized in the sera of infected individuals. KOLMER, BROADWELL and MATSUNAMI (*Jour. Exper. Med.*, 1916, xxiv, 333) using Zinsser's strain A of Treponema pallidum and a series of known sera obtained from patients with syphilis in different stages of the disease, studied the agglutinating properties by the macroscopic method. The sera were also controlled by careful Wassermann reactions. The control sera of normal individuals did not agglutinate the culture in dilutions of one in five or higher. But little evidence of specific agglutinins was found to appear in the blood during the primary lesion. On the other hand, 58 per cent. of the sera obtained in the secondary stage of syphilis showed definite agglutinins. Their presence became still more marked in tertiary and latent syphilis in which about 84 per cent. were positive. No direct relation between the presence of the Wassermann antibody and agglutinin was found. The former makes its appearance earlier and in higher concentration in all stages of syphilis. Strongly positive Wassermann sera may contain no demonstrable amount of agglutinin. The authors believe that the reaction for agglutinins may be made practical, but care must be taken in the choice of the culture for use in the test.

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DIRECTOR OF HYGIENIC LABORATORY, UNITED STATES PUBLIC HEALTH SERVICE, WASHINGTON, D. C.

Immunity to Trichinosis.—SCHWARTZ (*Jour. Am. Med. Assn.*, September 15, 1917, p. 884) found that serum from animals convalescent from trichinosis when injected into other animals does not produce immunity to trichinosis in the latter. Trichinous meat mixed with serum from animals during the active or convalescent stage of the disease proved to be still capable of producing the disease. Animals once infected and harboring trichinæ in their muscles are not immune to further infection when fed trichinous meat. Serum from a trichinous animal has no observable ill effects on the larvæ freed from their cysts by artificial digestion.

Malaria.—TRASK (*Public Health Reports*, December 22, 1916) states that in the territory extending from the Gulf of Mexico to a line north of the Ohio River and from the Atlantic seaboard to and into the eastern part of Kansas, Oklahoma, and Texas, few, if any, localities are entirely free from malaria. In most of the lowlands, it is very prevalent; in the mountains and better-drained areas less prevalent. The disease is also endemic in southeastern New York and parts of Connecticut, Rhode Island, and Massachusetts, and in California in the Sacramento and San Joaquin Valleys. There is probably no State in the Union in which the disease is not present and in which it is not spread by mosquitoes grown locally. The disease constitutes one of the big national health problems. It is also an economic problem of importance. The actual geographical distribution of the disease and its relative prevalence can be definitely determined only by making painstaking malarial surveys or by requiring cases to be reported to the health authorities and the authenticity of the reports verified by blood examinations.

Immunization against Typhus Fever.—McCOY and NEILL (*Public Health Reports*, June 1, 1917, p. 841) made studies to determine whether it is possible to immunize monkeys against typhus fever by means of a vaccine made from the Plotz bacillus (B. typhi exanthematici). The negative results obtained from these studies plainly show that monkeys cannot be thus protected against typhus fever in this way. These results also throw doubt upon the etiological relationship between the Plotz bacillus and typhus fever.

Dog Disease Nambi-uvu and its Parasite, Rangelia Vitalli.—CARINI (*Zentralbl. Bakt.*, 1916, Part 1, p. 265) states that the disease is prevalent in Brazil particularly among hunting dogs. The name Nambi-uvu means "bleeding ear" and it is derived from the fact that bleeding from the ear is a very prominent symptom. The disease is also associated with icterus and therefore often called the "yellow fever" of dogs. Another name is "blood plague" (peste de sangue). The causative parasite has first been described by B. R. Pestana in 1910 (*Rev. med. de Sao Paulo*, 1910, p. 423). The disease prevails during the entire year but it is most frequent during the summer. The author describes the symptoms, diagnosis, pathology, and etiology of the disease at some length. The disease is pathogenic to dogs only and newborn dogs are particularly susceptible. The acute form is the icteric, the subacute the hemorrhagic type. There is also a chronic mild type. The parasite is found in the blood. The blood of recovered animals remains infective. The mode of transmission from dog to dog is unknown. It is possible that ticks are responsible. The article contains illustrations of the life cycle of the parasite in the blood.

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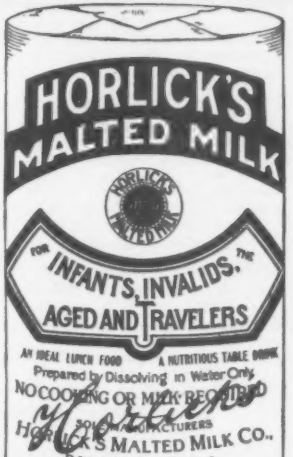

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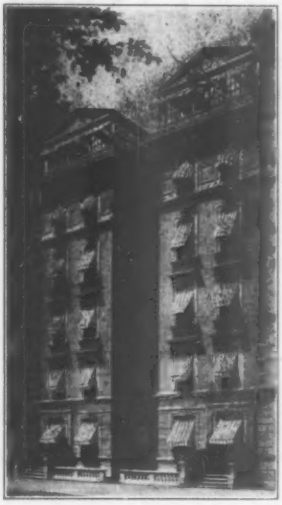

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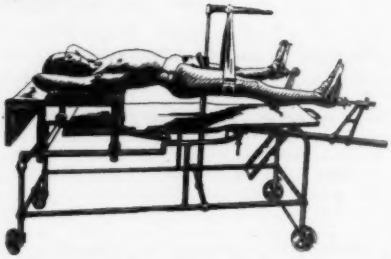

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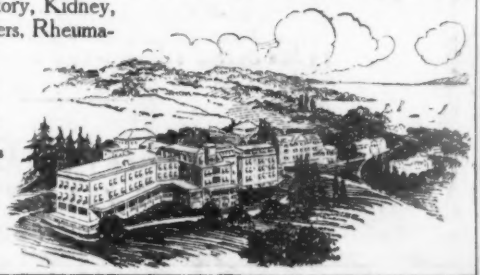
Hydrotherapy, Electrotherapy, Massage

The treatments under the direction of physicians are particularly adapted to HEART DISEASE, Circulatory, Kidney, Nutritional and Nervous Disorders, Rheumatism, Gout and Obesity.



WINTER CONDITIONS FOR TAKING THE "CURE" ESPECIALLY DESIRABLE

Send for Illustrated Booklets

Physicians are requested to send for literature detailing treatments, Mineral Springs analyses and other particulars.